COMMERCIAL FISHERIES Review

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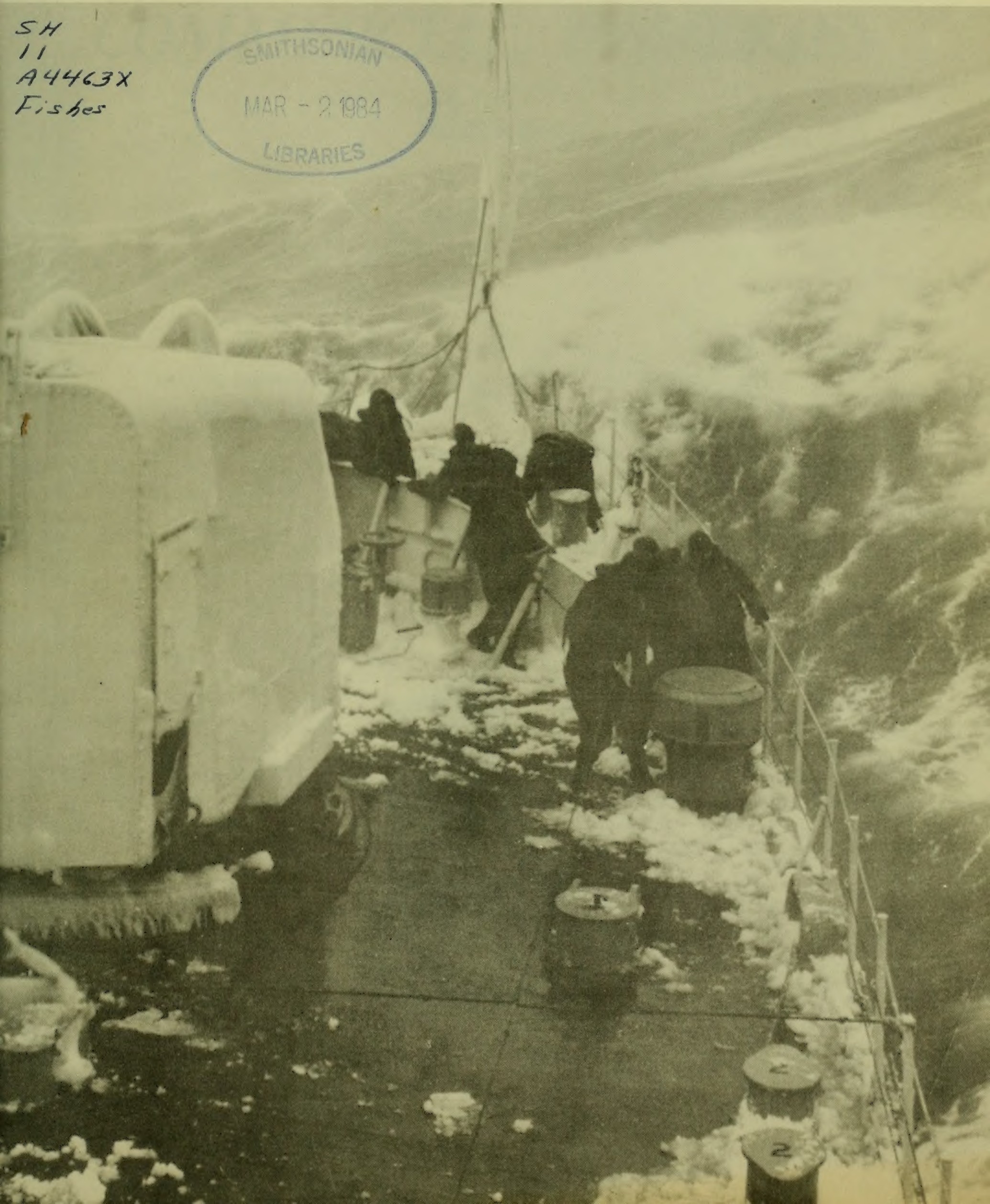
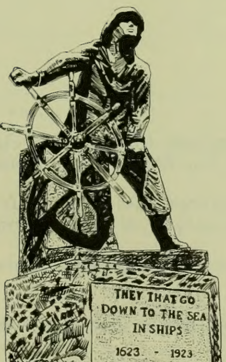


COVER: The Wintry Atlantic.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



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Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

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CONTENTS

Tilapia fry seek shelter in their mother's mouth when frightened--here, by the photographer's flash. (FAO)

STRUGGLE TO CLOSE PROTEIN GAP REPORTED BY 60 NATIONS

Sixty members of the United Nations family have responded to a questionnaire from the world organization asking what they are doing now and what they propose to do in the next 5 years to improve and increase "the production and human consumption of protein." Their answers, reflecting the state of their economic condition, prompted Secretary General Thant to warn about the "crippling urgency" of finding a solution to the problem.

The UN sent the questionnaire because it is studying a "possible reallocation of the resources" the agency itself is using to close the protein gap. It has compiled the answers in "The Protein Problem," along with statements by its own agencies: WHO, FAO, UNICEF, and the Protein Advisory Group (PAG).

From the 60 answers, the report states, "it is clear that there is widespread support for an immediate emphasis on the use of conventional sources of supply to meet protein needs." There is general recognition that "unconventional sources of protein will play an increasingly critical role."

For all nations, in all parts of the world, "the heart of the matter is to ensure adequate consumption of protein by the very young and by pregnant and lactating women."

THE PROBLEM IS NOW

The report rings an alarm: "The size, urgency, and rapid emergence of this problem must be fully understood. About half the population of the developing world is under the age of twenty years and about a quarter is below the age of eight. Thus, the number of growing children is already very large, and, irrespective of the effectiveness of present and future programmes to limit population growth, the young people already alive will themselves soon become the parents of yet more children. The key to the protein problem is to have sufficient supplies of appropriate foods, that will be accepted and actually consumed, ready in time to feed the children who will inevitably be born within the next few years. Indeed, the remainder of this century is likely to be crucial for mankind."

And the report emphasizes: "No blueprint for the solution of the problem can be developed by those unfamiliar with local problems. Plans which have any chance of being applied can be made only by those on the spot and aware of all the circumstances. Plans which do not lead to appropriate action do not help to solve the protein problem."

UN GROUP'S RECOMMENDATIONS

The Protein Advisory Group (PAG) to the UN's FAO/WHO/UNICEF, commenting on the replies, stated: "Because the largest volume of protein must come from conventional animal plant and fishery sources, which are currently the most acceptable and desired foods, their production, preservation, and storage must receive primary emphasis."

Concerning fishery resources, PAG recommended:

- "Improvement in the efficiency and broadening scope of both marine and inland fisheries, including fish farming. Investigations in this area must include methods of distribution, preservation, and marketing."

- The development of fish protein concentrate (FPC) and its uses in forms suited to local conditions. "Actual production should be encouraged in developing countries with substantial marine resources but only after preliminary trials have demonstrated that a wholesome product can be made from available raw materials and will have practical food use."

- "Encourage the development of fisheries with particular reference to the creation of demand for fish and fish products and the development of economic preservation and distribution techniques."

FISH

Fish is one of the best sources of protein in quality and quantity. But it can contribute more to world protein supplies than it does

now. The factors contributing to this condition are inadequate fishing boats and gear, shortage of trained fishermen, difficulties in preserving fish, a highly perishable food, and dislike of fish in some countries.

The answers to the UN questionnaire report the worldwide efforts to improve marine and freshwater fisheries. These efforts seek to identify and assess new sources of fish; conserve fishery resources; promote development of commercial fisheries in order to catch, process, and distribute widely fish and fish products acceptable to the public.

The UN Report points out that a country eager to modernize its fishing industry needs many modern fishing vessels with refrigerating and freezing capacity, fishermen trained to use this equipment, and transport, storage, and marketing facilities. Even if funds exist to build and operate such facilities, it would take too long to produce food that could have "quick impact on the protein problem. The production of marine fish may have to be a long-term aim."

The following reports reveal the state of affairs in the reporting nations--and also illustrate that of many other nations:

ASIA

INDONESIA: The long-term aim was accepted by Indonesian scientists studying the protein problem. They decided that it would take more ships and facilities to improve sea fishing quickly enough than can be "pressed into service immediately." In the short run, effort should be concentrated on developing inland or brackish water fisheries. These are easier to improve with existing knowledge, and immediate costs are less.

PHILIPPINES: The government is concentrating on fish rather than on livestock in its efforts to increase protein sources because the country has great fisheries potential--and it is less expensive than developing livestock production. Its first planned activity is to increase the area of fish ponds, especially in brackish water.

Its other activities show how expensive it is to develop a marine-fishing industry. It needs more vessels, greater efficiency of present vessel equipment, a pier, dry-docking space, and marketing facilities and refrigerated warehouses to store catch. It plans to ask the aid of FAO experts now on the islands to locate regional fishing ports and harbors.

SINGAPORE: Its first aim is to increase fish-pond productivity. Also, it is carrying out schemes to improve marine fisheries. A fish-training institute is being set up at Changi with the help of the UN Development Program to train off-shore and deep-sea fishermen. A marine fisheries research department is being organized at Changi, sponsored by the South-East Asian Development Center, with help from several South-East Asian countries and Japan.

This department "will function to develop fishing grounds by experimental fishing; to research into fishing gears, equipment, fishing methods and handling of fish at sea; to investigate fisheries resources and fisheries oceanography; and to train research personnel. The department will be equipped with a modern research vessel."

At the Jurong Industrial Wharf, a modern, multimillion-dollar harbor complex is being built. The harbor itself is completed. Other shore-supporting facilities--ice plants, cold rooms, and processing installations--are being set up. A central fish-auction market is being built and subsidiary markets are planned for other places. Private enterprise is being encouraged to take part. A few joint fishing ventures involving more advanced fishing nations have begun, and negotiations for others are well advanced.

The Singapore Economic Development Board gives loans to finance large fishing enterprises. The Primary Production Department plans a loan scheme for small fishermen and cooperatives.

The UN Report explains that it has detailed Singapore's operations "to illustrate the complexity of developing fisheries, the need for international cooperation and cooperation between Governments and private industry and the expense involved."

SOUTH VIETNAM: It is being helped by the United Nations Development Program (UNDP) to study the fish potentialities of the continental shelf.

SOUTH KOREA: Between 1962 and 1966, "there was remarkable development of fisheries in the republic. The government plans to increase production at a 15% annual rate

during the Second Five-Year Economic Development (1967-1971).

LATIN AMERICA

The FAO/UNDP Regional Central American Fishery Development Project covers several countries, including El Salvador, Mexico, and Panama. It will go on for 5 years. Its immediate goals are to gather information about fish resources, including crustaceans, in the Atlantic through exploratory fishing and laboratory study. The aim is industrial production and marketing--and improvement of the professional competence of fishery researchers in the area.

VENEZUELA: A 1967 agreement with FAO and UNDP makes possible the country's most comprehensive program of fishery research and development.

MEXICO: The National Biological Research Institute "is investigating the area, size, structure, and potential of known fishing grounds" and is trying to find new ones. It aims to develop the fishing industry and make it more efficient.

PANAMA: It is administering an FAO project to promote the eating of herrings. These are abundant in coastal waters, can be sold much cheaper than other fish--and have never been caught in commercial quantities or marketed on a large scale because they were not in demand.

EL SALVADOR: The government gives credits and technical assistance to those with artificial ponds for fish farming. Lakes are stocked with high-yielding fish. The "flourishing shrimp fisheries" are worked by 73 vessels, but nearly 80% of the catch is exported; only 1.5% is used for domestic consumption. There is a project to promote fish consumption under the Regional Fisheries Development Project.

PERU: 98% of the marine fish landed is used by the fish-meal and fish-oil industries; the remainder is eaten. Many species of available fish are not eaten. Little is known about fishing the countless rivers, lakes, and lagoons. Trout is abundant in Lake Titicaca in the Andean region; and it is popular fresh and preserved. Three firms produce canned trout.

Several government programs seek to develop fishery resources. It is state policy to encourage fishing for food fish. Peru provides tax exemptions especially for fishermen's cooperatives. Fishery activities are given credit priorities. Training is provided to operate cooperatives. There is an educational plan to promote the eating of fish.

The major obstacles to developing fishing for human use are: traditional industry methods; lack of knowledge of Peru's fishery resources; few firms interested in fish for human use; and demand is limited by high prices caused by poor marketing system and poor display. The government hopes these will be overcome by the Sectoral Fishery Plan, an integral part of the 1967-1970 Economic and Social Development Plan.

A 1964 decree contained incentives to promote industrial production of cheap protein foods for people. The decree exempts machinery and raw materials. It offers tax incentives to stimulate investment. All projects must be approved by the Institute of Nutrition, Ministry of Health and Social Welfare. The food to be produced must contain 10-70% protein.

GUYANA: The Ministry of Agriculture long has tried to develop marine fisheries. It provides credit, duty-free concessions for gasoline, oil, and nets, large discounts on ice purchases--and landing facilities in cities and rural areas. The government supplies selected species of freshwater fish to farmers who want to develop fish ponds. The fish are raised in carefully designed ponds and provide protein food for the farmers.

AFRICA

The UN report states that "essentially similar reports come from Africa."

ETHIOPIA: "Although Ethiopia's inland waters and the coast of the Red Sea have good potentialities for fish exploitation, the insufficiency of modern fishing equipment and the lack of technical know-how have greatly retarded the possible development of fish economy in Ethiopia. Also the potentials in the rivers, lakes and the Red Sea coast have not been completely surveyed. Obstacles for the development of the fishing besides the lack of equipment and vessels are due to an

underdeveloped market and a lack of organizations to help the small fisherman. At present, the greater part of the fish caught comes from the Red Sea while inland waters are still unexploited and used only for small scale fishing for the local population or not at all in areas where fish is considered a low status food."

The government plans to overcome these obstacles. The nation's first fish-exploiting project will soon begin in an inland lake to benefit the domestic market.

TANZANIA: Reports great potential for freshwater and marine fisheries, "which so far remain virtually unexploited."

LIBERIA: It has begun a pilot project to produce carp aided by the Oxford Committee for Famine Relief of the U.K. A private corporation, Mesufish, distributes saltwater fish to nearly all major population centers. The source is the offshore waters of Liberia and west Africa. After processing and freezing, it is distributed to cold-storage centers-- "from whence it moves into retail channels, largely operated by local marketers. The result of this private initiative has been to make fish protein available throughout the country at prices lower than have been realized previously."

NIGERIA: The Federal Government has invited experts to study the potential of the fish industry in order to increase the eating of fish protein.

MIDEAST

The UN Report states: "In Cyprus, Iraq, Jordan, Kuwait, Malta, and Turkey, activities essentially similar to those already described for other parts of the world are in progress or planned."

ISRAEL: Research has produced practical results in controlling brackish water and freshwater algae that produce toxins lethal to pond fish. The work is continuing at the Hebrew University-Hadassah Medical School and the Fish Breeding Research Laboratory.

EUROPE

The Report continues: "France, the Netherlands, Norway, and the United Kingdom as well as Canada report constant efforts to improve their own fisheries and catches, although during recent years the Swedish fishing industry has tended to stagnate, mainly due to competition from inexpensive foreign-caught fish."

UNITED KINGDOM: Government laboratories conduct much sea-fisheries research "to help the fishing industry to catch fish efficiently and economically and, in collaboration with scientists of other countries, to provide the scientific basis for conservation measures to protect the stocks and ensure rational exploitation of the resources." There is research to develop techniques to rear artificially in tanks plaice, sole, turbot, oysters, clams, and prawns. It is too early to say whether this fish farming can become an economic or competitive source of food.

Good progress is reported in rearing young fish to marketable size in sea-loch enclosures and in warm water discharged from generating stations. A pilot-scale plant has been built to develop methods to mass-produce shellfish. Research is starting on river management to increase production of salmon, sea trout, and brown trout. The National Environment Research Council is investigating possible use of krill and unexploited Antarctic fish stocks as new protein source.

FRANCE: Sea resources are developed by intensifying traditional fishing, improving fishing techniques and methods of preservation, developing new methods of exploitation, creating new resources, and utilizing better fish-protein resources. Research on hydrobiology of freshwater fish and other living organisms is being expanded.

Both France and the United Kingdom reported their aid to developing nations, "particularly in education and training, catching ability, processing and distribution, fish culture and research." France aids the Ivory Coast, Malagasy, and Senegal. Le Centre Technique Forestier Tropical operates a UNDP project to train fishery personnel and conduct research in fish culture in Cameroon, Congo (Brazzaville), Gabon, and the Central African Republic.

PROTEIN FROM UNCONVENTIONAL SOURCES

"If the protein problem is to be solved," says the UN Report, "use must be made of protein from new and unconventional as well as traditional sources; waste fish was at one

time widely used as a fertilizer; later on techniques were developed for preparing fish meal for use as animal feed, and more recently much effort has been devoted to refining methods of production so that now it is possible to produce a bland fish flour intended for human consumption which is usually called fish protein concentrate."

FISH PROTEIN CONCENTRATE (FPC)

Chile reported that it had "enthusiastically welcomed the offer made by FAO and UNICEF in 1956 to set up the first pilot plant in the world at Quintero to produce fish flour for human consumption." This followed laboratory tests with South African samples produced by refining products designed for feeding animals. Technical and administrative problems hampered progress, but finally Chile produced a fish flour. "Chilean and foreign research workers have pronounced it nontoxic, of high nutritive value, stable, easily digested and assimilated either directly or as a supplement to conventional foods and preparations."

Other countries followed Chile's example. And, in Chile since 1964, the government promoted and supported studies of ways to use the product. During the last 2 years, protein-rich mixtures have been developed and tested successfully on very young and school-age children. Trials are planned in rural communities, in cooperation with the food industry, to use the mixtures in the feeding programs of the National Health Service and the School Welfare Board. The estimated demand for these programs, compulsory by law, is much greater than the production capacity of even the most modern fish-flour plants in Chile. So the problem of putting the concentrates on the free market and keeping them from groups other than the children "is less acute than it is in other countries with different administrative and political structures and a different economic and social system."

The UN has surveyed possibility of commercial production in Chile and Brazil.

EL SALVADOR: A Panamanian Health Organization (PAHO) expert has advised the government that because the fishing industry is not being developed, the production of fish protein for human use is not likely in the near future.

PERU: Production is encouraged and research is under way: e.g., the use of stickwater in fish-meal factories.

URUGUAY: There is laboratory production of a powder made by drying a material produced by fermentation of ground fish with yeast and sugar. "This powder is hygienically prepared, stable, cheap and highly nutritious and has been tested successfully in feeding undernourished children." There are plans to produce the material in a pilot plant at the Fisheries Research Institute.

ETHIOPIA & SWEDEN: Together, they are trying to produce FPC for humans. In Massawa, on the Red Sea coast of northern Ethiopia, a modern fish-meal factory, originally a Bulgarian-Ethiopian venture, was built to produce fish meal for animal feeding. In Sweden, fish meal is used for animal feed, but production at the Ethiopian factory has stopped because of supply and marketing difficulties. Recently, the Ethiopian Ministry of Commerce and Industry asked Swedish private industry to study the possibility of using the existing fish-meal plant, vessels, and fish resources in the Massawa region to produce FPC. Possibly, the product might be used as an ingredient of supplementary mixtures for children or in feeding school children.

MOROCCO: The UN is helping Morocco redesign its FPC plant at Agadir and promote and market its products.

NIGERIA: A foreign company is studying the practicability of making FPC. It is afraid that the price may be too high for needy Nigerians.

TANZANIA & NETHERLANDS: An experimental factory to produce FPC has been built in Tanzania. The planners will try to manufacture a product people will accept. The Instituut voor Visserijprodukten T.N.O. of the Netherlands is helping. Tanzania reports the project hampered by lack of fishing gear. It has found that samples made from freshwater fish appear to be more acceptable than those from marine fish. One aim is to set up several pilot plants on Lakes Tanganyika and Victoria to produce about 10,000 tons. This would require 80% of the present fish catch and might stimulate industry.

A second aim is to manufacture high-protein food supplements with FPC for children. "This will require market research, recipe development, studies on consumer acceptance and methods of publicity and an appropriate team of research workers." A third plan is to study possibility of making marine FPC.

SOUTH KOREA: The production of FPC from waste fish might help improve the fisherman's income and stimulate the poorly developed fishing industry. The Department of Fisheries Processing of the Pusan Fisheries College is investigating the experimental production of FPC. This work is financed by the Ministry of Science and Technology.

THAILAND: A.I.D. of the U.S. and the Oceanic Development Corporation have approached the Thai government about the possibility of producing FPC.

SOUTH VIETNAM: It is not now considering production because fresh fish are insufficient to meet demand. But it is aware of the possibility of adding FPC to bread and using it in supplementary foods for children.

PAKISTAN: FPC is not made, but the government is aware of its usefulness.

TURKEY: Experiments are in progress.

FPC: EUROPE

France, Norway, the United Kingdom, Sweden, and the Netherlands "have considered the subject but report no positive development." The Soviet Union is working to enrich bread with FPC and also "the preparation mixtures of this concentrate with plant products."

CANADA: Production and large-scale marketing of FPC are unlikely within the next 3 years. Likely to continue are small-scale production for nutritional evaluation. "Full commercial scale production is likely to develop three to five years hence."

The UN Report concludes the FPC section with the statement that, for developing countries now, the necessary technology would make FPC expensive compared to more conventional protein sources.

WHAT UN IS DOING ABOUT PROTEIN PROBLEM

FAO recognizes that if a country's staple food is cassava, sago, or plantains, this will provide little protein. An important part of FAO's plan to aid developing regions is to supplement such crops by fish or rice or maize, which can be grown locally and are better proteins. FAO also helps to increase production of grain legumes, including soya beans. "However, regions unaccustomed in the use of these good sources of protein must be educated in their processing and consumption."

FAO is working to improve the contribution of the world's marine and freshwater fisheries to world protein supply. Its activities include "identifying and assessing new sources of fish; conserving fishery resources; and promoting the development of commercial fisheries with the object of catching, processing and distributing fish and fish products in acceptable form as widely as possible throughout the world."

FAO is investigating the harmful effects of pollution on marine and freshwater fishery resources and fishing. It is studying the great manmade lakes and reservoirs, especially in Africa, so they can be managed for greatest production.

FAO is helping to avoid waste. It is helping governments to develop the food processing and distribution industries. Codes of practice for fish and fishery products, and for freezing fish, are being developed. These will help prevent losses during storage and distribution.

The Protein Advisory Group (PAG) has prepared tentative processing and quality guidelines for developing high-grade standardized protein products from oil-seeds and fish. Its membership has been expanded to include experts in many specialties.

Asks Fuller Report in 2 Years

Although the 60 governments provided voluminous material, PAG asks that "a more complete report be prepared in two years' time to allow for the development of country replies and their analysis."

UNITED STATES

4 SCIENTISTS WILL LIVE AT 50-FOOT OCEAN FLOOR 60 DAYS

Early this year, 4 U.S. scientists will live and work on the ocean floor off the Virgin Islands for 60 days. The major purposes of the operation, called TEKTITE I, are to help determine the kind of worthwhile marine research scientists can conduct when placed in the sea--and to see how the scientists behave under the stress of a strange setting. The latter information would be useful also to space scientists.

TEKTITE I is a combined operation of the U.S. Navy, NASA, Department of the Interior, and the General Electric Co., builder of the underwater habitat to be used by the scientists. ('Tektites' are small minerals that have survived a blazing journey through space to land on earth or in the ocean.)

The Habitat

The ocean-floor home of the scientists, a pressurized laboratory, is 2 vertical structures 18 feet high and 12 feet in diameter. These are connected by a 4-foot-diameter tunnel. Each structure has 2 living compartments, one atop the other. Food will be carried down in the habitat. A lifeline linking it to shore will supply water and the breathing mixture of oxygen and nitrogen. Power and communications will be provided by separate cables.

The Scientists

The 4 scientists, all from Interior Department, are: Richard A. Waller, Conrad Mahnken, John Van Derwalker, and H. E. Clifton. They will be in voice communication with colleagues on land. Throughout the operation, behavioral scientists and doctors will watch the aquanauts-scientists through closed-circuit TV.

SOME INTERIOR DEPARTMENT GOALS

The Department of the Interior is represented in TEKTITE I by BCF, the Bureau of Sport Fisheries and Wildlife, Geological Survey, and the National Park Service (NPS).

The scientists will study phytoplankton, the microscopic plants that drift in ocean currents and are food for larger animals in the ocean's food chain. Water samples containing plankton will be pumped to the habitat from different depths in order to measure the biological richness of the area.

The zooplankton, microscopic animals that feed on phytoplankton and are themselves eaten by fish, also will be studied. The emphasis will be on their relationships to other marine life and to the reef area. Such plankton studies usually are conducted from a rolling ship by lowering sampling devices. Direct observations from the ocean floor should be better.

How Productive Is Marine Life?

The scientists will use different methods to measure production of marine life in ocean and reef areas to compare the relative advantages of these methods. The conventional estimate of productivity is based on measurements of the oxygen produced and consumed in a certain period. During TEKTITE I, special equipment will be used to entrap organisms and then measure their oxygen production and absorption of radioactive carbon (C^{14}). These studies may enable scientists to standardize methods and reduce the present variations in estimates of organic production in ocean waters.

Study Marine Organism Behavior

Most marine organisms act in characteristic patterns when foraging, mating, and fleeing predators. Greater knowledge of these activities would lead to better understanding of the life history of certain species; and, if commercial species were involved, to development of the best gear to catch them.

Early in the operation, spiny lobsters (source of 'lobster tails'), reef and predator fishes, and some mollusks will be tagged with sonic transmitters. Then the movements and habits of these species will be monitored on a small, portable, sonar device. Even if an animal secretes itself in a coral burrow 4 miles away, the device will be able to detect the signals. The tagged animals will be followed day and night. When a lobster is found,

Fig. 1 - The TEKTITE I habitat undergoing systems tests in Philadelphia Naval Shipyard.

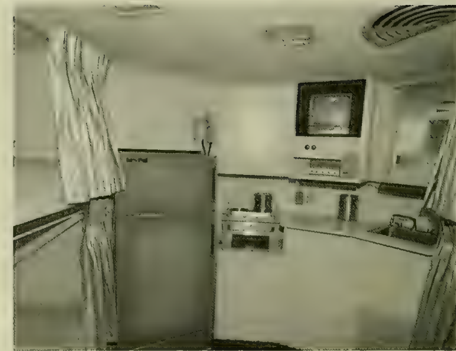


Fig. 3 - Interior view of quarters: bunks for the 4 aquanauts-scientists, entertainment console, and galley.

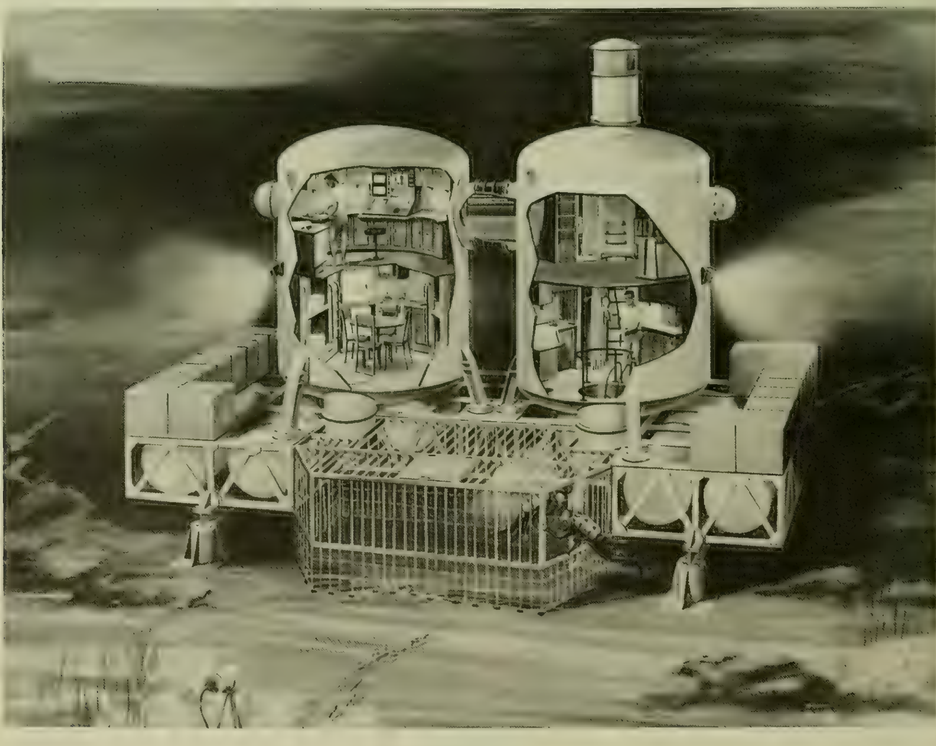


Fig. 2

the scientists will be able to determine its identity by a brand visible at night under ultraviolet light. When several representatives of a species are monitored, the scientists will accumulate information on "growth and survival, feeding habits, daily migrations, reproduction, responses to environmental changes," and other aspects of the species' life. Such observations are very difficult to make from the ocean surface.

Acoustical Studies

The increasing use of sonar in fishing makes it important to study its effectiveness in differentiating fish species--either by a characteristic signal return from one fish, or by signal recognition of swimming or schooling behavior of a group of fish. TEKTITE I will be an unique opportunity to identify sonar target species and correlate them with their acoustical "signatures."

TEKTITE SITE

The site of TEKTITE I is Beehive Cove in Greater Lameshur Bay, on the south shore of St. John Island in the Virgin Islands, about 900 miles southeast of Miami, Florida. The cove is in Virgin Islands National Park, administered by the National Park Service.

The water is very clear and warm, and tropical plant and animal life is abundant. The many coral reefs are home to vast reef-fish populations, spiny lobsters, and other marine life.

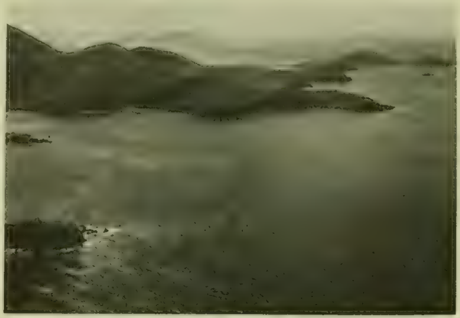


Fig. 4 - TEKTITE SITE. Aerial view of Greater Lameshur Bay off St. John Island in Virgin Islands National Park. (NPS: Fritz Henle)

First-Half 1968 Commercial Landings in Great Lakes Dropped

For the first 6 months of 1968, preliminary statistics from Michigan, Ohio, Pennsylvania, and Wisconsin show Great Lakes commercial landings of 32.3 million pounds; the figure for first-half 1967 was 41.3 million. This information is provided by the 8-state Great Lakes Commission.

BCF data showed 1967 landings for these states of about 78.5 million pounds--96% of the 8-state total for the lakes.

Ontario fishermen, who account for all of Canada's Great Lakes commercial catch, took nearly 20 million pounds in first-half 1968. It is a preliminary figure. The catch is 2.6 million pounds above the 1967 period.

1968 L. Michigan Catch

The first-half 1968 Lake Michigan catch by Michigan and Wisconsin commercial fishermen was 21 million pounds; it was 29.3 million in first-half 1967. The 1968 alewife catch was 12.5 million by the end of June.

Lake Erie

The 3 Lake Erie states reported first-half 1968 commercial landings of 7.8 million pounds, compared to the 1967 period's 8 million. Yellow perch landings, among the more valuable species, were 1.8 million pounds, 425,000 pounds more than in 1967. White-bass catch was 500,000 pounds, only half the 1967 figure.

Lake Superior

The Michigan-Wisconsin catch in Lake Superior was 1,958,000 pounds, nearly 200,000 pounds below the mid-1967 figure; the decline in lake herring was responsible for about half this loss. The catch of valuable lake trout, protected in Lake Superior, was over 113,000 pounds by June 30.

In Wisconsin, the 1968 catch quota of 75,000 pounds of lake trout was the same as in 1967. The quota is set to gain biological data necessary to follow the lake trout's recovery. In Michigan waters, the 1967 quota of 145,000 was raised to 330,000 pounds for 1968.

Lake Huron

Through June, the Lake Huron catch in the Michigan part was a little under 1.5 million pounds, a drop of 50,000 pounds from 1967. Landings of yellow perch and chubs, most important to Huron's commercial fishermen, declined more sharply. The perch catch of 365,000 was 30% below the mid-1967 figure. Chub landings dropped 40% to 86,000 pounds.

Ontario's Great Lakes Waters

In Ontario's Great Lakes waters, the important factor in a 1968 gain was the increase in Lake Erie landings: from 14.1 in 1967 to 16.4 million pounds. Smelt catch rose from 4.6 to 7.2 million pounds; it made up losses for some other species, among them yellow perch. The decline in Lake Erie's perch harvest from 8.2 to 7.6 million pounds may be attributed to new controls aimed at problem of oversupply. Provincial authorities report perch abundant in the lake, and expect fishermen to have no trouble catching second-half 1968 quota. For the other lakes, Ontario commercial landings rose in all areas except Lake Huron.

Lake Trout Releases Approach 30 Million

The young hatchery-reared lake trout released in 1968 in lakes Superior and Michigan exceeded 5 million for the third straight year. Records of the Great Lakes Fishery Commission show the number released in Lake Superior since 1958 has reached 22.6 million; for Lake Michigan, where plantings began in 1965, the total is 7.3 million.

In 1968, plantings of lake trout in Superior were 3,481,000 yearlings; a half-million of these went into Canadian waters. In U.S. waters, plantings were made in about 20 locations. These extended from Minnesota's North Shore to Whitefish Bay at the lake's east end.

Lake Michigan's 1968 plantings of 1,876,000 lake trout were made at 16 dispersed locations, including several in the lake's southernmost section. As reference, the U.S.-Canadian fishery agency used a system of fin-clip identifications for the young fish to show time and place of planting.

Haddock Recruitment on Georges Bank Continues to Fall

The joint cruises of BCF's 'Albatross IV' and the Soviet research vessel 'Blesk,' completed in fall 1968, provided useful information on survival of the 1968 spawning of Georges Bank haddock. Again, the abundance index of young-of-the-year was nearly zero. This makes the fifth consecutive very poor year-class, an unusual situation. It spells bad news for the haddock fishery for at least 1969 and 1970.

1963 Class Losing Dominance

The 1963 year class, which in recent years has been supporting the fishery, soon will lose its dominant position. The abundance of haddock has fluctuated widely. The 1963-year class was the largest in history. But, as it reached marketable size in 1965 and 1966, it was fished hard. The Georges Bank population is suffering from that overfishing. There is a real possibility now of depleting the spawning stock.

Browns Bank

The Browns Bank situation is similar. However, because of the slower growth rate there, the 1963 year class will remain in the population 2 years longer.

Halibut Fishing Effort Declines

In 1968, U.S. and Canadian halibut vessels made only 1,286 trips. In 1967, the figure was 1,750 trips; in 1966, 1,965. The 1967 decline resulted largely from strikes in Canada, the 1968 decline from low prices.

Total 1968 landings reached only 49 million of the 58-million-pound quota. Average production per trip rose slightly from 31,000 pounds in 1966, to 32,000 in 1967, and to 38,000 in 1968.

Good Outlook for N. California Crab Season

Northern California crab fishermen again can expect a good season, reports the California Department of Fish and Game. The 1968/69 landings are expected to be between 9.5 and 11 million pounds. This would be below the preceding year's outstanding catch of 12.2 million pounds--but well above the 10-year average of 7.3 million pounds.

The northern season, covering Fort Bragg to Crescent City, opened December 1 and will continue through July 15, 1969.

Crabs Better & Heavier

Marine biologists of the Department's Shellfish Investigations have been sampling the commercial catch since 1964. This season's predicted catch is based on samplings during the first 10 days.

The crabs appear in slightly better condition this season. The average size of legal crabs is substantially larger than last season's. The average weight of crabs in the commercial catch up to the end of 1968 was 2 pounds, compared with 1.8 pounds last season.

Tuna Fleet Grows

In mid-November 1968, the new tuna purse seiner 'Marietta' sailed on her maiden voyage. Her 65-ton carrying capacity brings the fleet's total, including that of small bait boats, to about 46,000 short tons.

The aggregate capacity of all fleets in the eastern Pacific tuna fishery is about 55,400 tons. In 1968, the U. S. added 6,000 tons and the other countries the same amount.

Trend to Continue

The growth of the tuna fleet is likely to continue. The vessels now being built, or in planning stage, will add an average of more than 6,000 tons a year to U.S. fleet for the next 3 years.

Other nations plan to expand and modernize their fleets. And some nations, not now fishing the eastern tropical Pacific, are thinking of participating.

Battelle Reports Vaccine Effective Against A Salmon Disease

Scientists of the Battelle Memorial Institute report that an oral vaccine has been successful in the laboratory in preventing *C. columnaris* disease. The disease has been killing many salmon and steelhead in the Columbia and other rivers. Several years ago, *C. columnaris* virtually destroyed a sockeye salmon run on a tributary of Canada's Fraser River system.

The oral vaccine, which can be mixed with fish foods, was developed by M. P. Fujihara in Battelle's Richland, Wash., laboratory, and has been used to protect juvenile salmon.

Years of Work Ahead

Fujihara said: "The oral vaccination of juvenile salmon against columnaris has been successful under controlled laboratory conditions. However, successful application of the oral vaccine to large scale production hatchery use will require several years of continued study. Identification and thorough knowledge of the disease is necessarily the first step in developing practical solutions." Fujihara, a biological scientist, and R. L. Tramel, a technician, have used the fish's ability to develop antibodies against the columnaris pathogen as a new method of surveying fish to determine disease exposure. This survey technique is said to be a sensitive, more effective, way to survey for *C. columnaris*.

Survey Technique

Juvenile salmon were examined during downstream migration from spawning grounds to the ocean. Adult salmon were examined during migration from the Columbia's mouth to tributary spawning grounds in Washington and British Columbia. Blood serum and other samples were taken from hundreds of coho, sockeye, and spring and summer runs of chinook (king) salmon. After the samples were taken, the adult salmon were returned live to the river and tributaries. Similar blood-serum samples were taken from individual yearling rainbow trout in the laboratory once a week for 6 months without harming them.

Field investigations have shown that about one-third the juvenile sockeye salmon sampled had been exposed to the disease during downstream migration and while entering the ocean. Antibody production was observed in about $2\frac{1}{2}$% of the adult sockeye sampled as they entered the Columbia's mouth.

Migration Hazards

"However," Fujihara noted, "both columnaris exposure and magnitude of antibody production increased during upstream migration until 70-100% exposure was observed on the spawning grounds." Some of the fish, on the upstream trip to spawning beds as far as 1,000 miles away, will be killed by "disease, exhaustion, predators, fishermen or barriers in the stream."

Studies have shown that population density and development of immune disease carrier fish (present in fish ladders) may be major source of disease exposure and infection during upstream migration.

Fujihara concluded: "This oral vaccine appears to be a practical and effective method for protecting young salmon against columnaris. If we could increase juvenile salmon immunity to columnaris to nearly 100 percent, more adults could make the return trip to their spawning grounds, or if we increase general survival by 10 percent, we could possibly double the number of adults which could return to the spawning grounds.

"Mixing this vaccine, and a vaccine against another salmon disease--furunculosis--into fish food may help control two of the main bacterial diseases of hatchery reared juvenile salmon. Columnaris vaccine incorporated into fish food could be extremely useful to State and Federal hatcheries which rear salmon."

Kodiak, Alaska, May Be No. 2 U.S. Fishing Port

Observers estimated in Nov. 1968 that the Port of Kodiak would have landings worth more than $15 million in 1968. The estimate was based on preliminary data compiled by the Kodiak office of Alaska's Department of Fish and Game. This would make Kodiak the second most important U.S. fishing port.

No. 3 in 1967

In 1967, San Pedro, Calif., was first with landings worth $29 million. New Bedford, Mass., was second with $16 million. Kodiak's $10 million placed it third.

Maryland Reports 1967 Was Record Year

The value of commercial fisheries products landed in 1967 was a record $16,912,898, reports Joseph H. Manning, Director, Maryland Department of Chesapeake Bay Affairs.

The value of manufactured fisheries products was estimated at more than $40,000,000.

Oysters led in landed values, 66% of total. Crabs were 14%; soft clams 9%; finfish 9%; hard clams and all other categories 1% each.

The Industry

About 9,000 fishermen--2/3 of them have no other employment--harvest Maryland's seafoods. About 6,500 boats and vessels harvest and transport the catch. The number of wholesale and manufacturing establishments has declined steadily: from 357 in 1957 to 285 in 1965. But the number of workers has remained "remarkably constant, never varying more than 209 from the mean of 4,355." The decrease in number of firms follows the general trend of consolidation in the food-processing industry. In the past 30 years, many small seafood processing plants were forced out because they were unable or unwilling to meet the costs of rising sanitation standards.

The seafood industry has recovered dramatically from the low point in 1963. Landings increased at a rate of $1.5 million a year.

Leads U.S. in Oysters

Maryland led the U.S. in oyster production during 1966 and 1967 "by a very substantial margin." Landed value of the 1967 harvest was $11,191,431, more than one-third the value of U.S. harvest.

Manning believes that Maryland's tidal waters are perhaps unmatched in the world as an environment for oyster growth. He warns, however, that the State's capacity to produce oysters is "not unlimited." The salinity range of Maryland's part of Chesapeake Bay is uninviting to starfish, one of the oyster's most effective predators; Maryland's tidal waters are troubled by boring snails only along the lower Eastern Shore. The oyster parasite 'Minchinia Nelsoni' (MSX) and 'Dermocystidium Marinum,' a marine fungus that probably kills more oysters in the U.S. than any other organism, are present in about one-third of State waters; they have caused many deaths. Occasionally, the Bay is hit by hurricanes. Storms like Hazel in 1954 do much damage. Throughout shellfish-producing waters, oysters must compete for space and food with many organisms. They are attacked by several predators. But the Maryland oyster has a much better chance to live to old age than oysters in most areas. The oyster's "normal" natural mortality rate is estimated at 10 to 15%.

State Help Since 1961

Since 1961, Maryland has invested annually about $\$1\frac{1}{3}$ million to restore productivity of the oyster resource. This had declined in almost a hundred years because of "overexploitation, neglect, and mismanagement."

This State effort has been based on (1) use for oyster cultch of centuries-old shell deposits buried in Chesapeake Bay, and (2) application of "farming" practices to management of the State's natural oyster bars.

Since 1961, 3 to 4 million bushels of dredged shells have been planted annually in the State's seed areas. Also, another 1 to 2 million bushels of dredged shells are planted to maintain "self-sustaining" natural oyster bars.

Manning projects a bright future for private oyster planters willing to invest in Maryland's efforts to remain the leading oyster-producing State. A 150% increase in production has not affected significantly the unit price received by public oystermen for their catch. It seems unlikely that oyster production in any other leading oyster State will increase during the next few years; in most, continuing decline is forecast.

Manning states: "We find no reason to believe that Maryland's private oyster fishery cannot undergo orderly developments without harm to the public fishery, and without abandonment of the time-honored concept that the natural oyster bars of the State are the common property of its citizens."

Coho Swim Over Willamette Falls in Record Numbers

Nearly 17,600 coho salmon, including 5,300 jacks, were counted over Willamette Falls in fall 1968. This doubled 1967's escapement and set a record, reported the Oregon Fish Commission.

Based on catch-to-escapement ratios, the record number over the Oregon City salmon barrier represented 36,000 more coho harvested by sport and commercial fishermen in 1968.

Of total escapement near the end of 1968, 94% chose the completed cul-de-sac part of the new fishway instead of the old, inadequate ladder. Early in the run, water levels were low and the coho chose the cul-de-sac because there was more attraction water. Later, as happened in previous years, water velocities over the old structure increased so passage became impossible. However, fish that used the cul-de-sac were not delayed. When the fishway is completed, no run will face the critical delays developing from extreme flows.

Increased Stocking

The 1968 record resulted from greater stocking efforts designed to develop the "tremendous natural potential of the Willamette system." From 1951-1960, the average annual juvenile coho release into the Willamette tributaries above the falls was less than 300,000. Since that period, juvenile coho releases rose to 6,500,000 a year.

Also, starting in 1964, the Fish Commission has transported and released around 7,000 adults each year into the Willamette system. The Oregon Game Commission and the U.S. Fish and Wildlife Service provided more trucks to help carry these surplus hatchery fish. These fish have become available only in recent years after the success of the Fish Commission's coho hatchery program.

The Commission notes the significance of coho returning to the Yamhill, South Santlam, Molalla, and the Mary's Rivers. In these rivers, coho runs never existed before the Commission's planting program.

Large Coho Runs Possible

Biologists estimate conservatively that the 1968 coho run in the Willamette can be tripled by natural production alone. The Fish Commission says that achievement of this potential depends on the fishway's completion. This is being paid for by Portland General Electric and the Bureau of Commercial Fisheries. Another factor is solving a serious downstream mortality problem at the falls' industrial complex that claims many young migrants.

The Fish Commission reported too that adult fall chinook counts, also double the 1967 count, had set a record.

DO YOU KNOW?

Lobster tag is not a game. BCF scientists think it is serious business. Recently, they "tagged" 2,000 lobsters off the coast of southern New England. They hope to learn more about the speed and extent of lobster movements, rate of growth, and the ages at which lobsters are most vulnerable to natural enemies other than man.

Harmless yellow plastic tags are attached to a lobster, and a reward is paid for each tag returned to BCF's Biological Laboratory at Boothbay Harbor, Maine. Although the tagging study has been underway only a short time, Bureau scientists have already learned that lobsters travel farther and faster than they had expected. One lobster covered 97 miles of ocean bottom in 27 days; another, an egg-bearing female, traveled 77 miles in 28 days.

--Catherine Criscione

U.S. FISHERMEN CATCH MANY TUNA OFF WEST AFRICA

The U.S. tuna catch off West Africa during the 1968 season was expected to total more than 10,000 tons of Atlantic yellowfin and skipjack. BCF reported that dockside value was expected to bring U.S. fishermen about $2.5 million.

Interest in the fishing grounds off West Africa was stimulated when 3 U.S. tuna boats, transferring operations from the Pacific to the eastern Atlantic during the second half of 1967, reported a catch of 1,500 tons.

In mid-June 1968, shortly after the yellowfin quota for the Pacific was reached, 8 tuna seiners, with carrying capacities of 450 to 1,000 tons, shifted to the eastern Atlantic. Fishing efficiency was increased by off-loading catches at Abidjan, Ivory Coast, and Tema, Ghana, for transshipment to the U.S. This enabled the seiners to return promptly to the tuna-rich Gulf of Guinea.

Assisted by R/V 'Undaunted'

Fishermen were assisted by BCF's research vessel Undaunted, which transmitted on-the-spot information about tuna school locations to the U.S. fleet. Undaunted is

assigned to BCF's Tropical Atlantic Biological Laboratory (TABL), Miami, Fla.

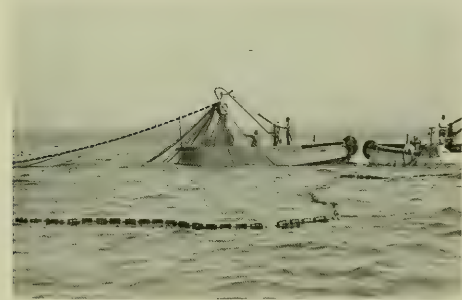
Much of TABL's program is devoted to gathering and interpreting fishery and oceanographic data on tuna in the tropical Atlantic. In cooperation with BCF's laboratory at La Jolla, Calif., U.S. fishing interests, and foreign scientists working in Africa, TABL personnel have compiled voluminous data on tuna stocks in the eastern Atlantic.

During 1968, TABL prepared "Tuna Purse Seining in West Africa, July-November," a guide for commercial fishermen planning to operate in the eastern Atlantic tuna fishery. It is a summary of information on tuna species, landings, fishing procedures, and favorable catch locations at specific times.

MENHADEN

In 1968, menhaden, which are converted into oil and fertilizer, or used as bait, made up nearly one-third of total U.S. landings of fish and shellfish.

The greatest catch increase occurred in the Gulf of Mexico. The Chesapeake and Middle Atlantic States followed.



Figs. 1 and 2 - Hauling in menhaden purse seine off North Carolina.

Fig. 3 - Flooding hold to unload menhaden catch.
(Photos: Bob Williams)

OCEANOGRAPHY

Scripps 'Washington' Is Studying Deep Ocean Off South America

The Scripps Institution of Oceanography's research vessel 'Thomas Washington' left San Diego, Calif., Dec. 9, 1968, on a 9-month biological, geophysical, and physical scientific exploration in the eastern Pacific Ocean. The first port of call of the 209-foot, 1,362-ton vessel was Antofogasta, Chile.

The 33,500-mile 'Piquero Expedition' will concentrate on the deep ocean off the west coast of South America, but it also will work on the continental shelf, according to Dr. Bruce A. Taft, cruise coordinator.

In Peru, piquero is the common name for the Peruvian Booby, the dominant bird of the Peru (Humboldt) Current. The bird's white head, neck, breast, and speckled back are distinctive.

Many Scientists Involved

During the Piquero's 9 legs, 130 scientists and technicians from the U.S. (including 16 Scripps graduate students), Chile, Peru, France, and the United Kingdom will conduct research.

Piquero is supported by the Office of Naval Research, Atomic Energy Commission, and the National Science Foundation.

Wide Study

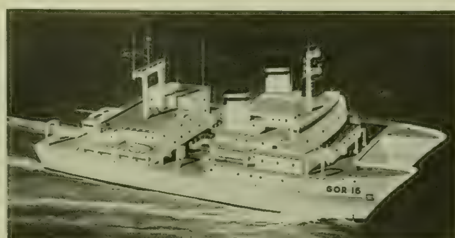
The investigations will include "an analysis of seawater samples for concentration of noble gases, such as xenon and helium, near the East Pacific Rise, a north-south underwater ridge on the eastern side of the Pacific; a major study of the physical oceanography of the Chile Current, including direct measurements of currents in the Drake Passage, between Cape Horn, Chile, and the Palmer Peninsula of Antarctica."

The scientists also will explore the relations among plankton, nutrient distribution, and currents west of Peru; a study of possible sea-floor spreading between the East Pacific Rise and the South American continent; and intensive study of animal and plant growth in upwelling water off Callao, Peru.

Between the Galapagos Islands and the mainland, the scientists will study the characteristics of the sharp boundary between the Peru Current's cold and salty waters and the warm and relatively fresh waters to the north. Also, they will study the circulation near the equator east and west of the Galapagos. The latter study will concentrate on determining the barrier effect of the Galapagos Islands on the flow of the subsurface Equatorial Undercurrent.

Navy Orders Unusual Oceanographic Ship

The U.S. Naval Ship Command System has awarded a $13.5-million contract to Todd Shipyards Corp.'s Seattle division to build the first of 9 oceanographic ships of a novel design.



Artist's conception of AGOR-16 Navy oceanographic research vessel (catamaran hull) being constructed for the U.S. Navy by Todd Shipyards Corporation, Seattle Division.

The prototype ship will become the Navy's first catamaran-style hull for oceanographic research. She will be 246 feet long, have a beam of 75 feet, displace 3,080 tons fully loaded, and travel at 15 knots. She will accommodate 25 scientists and a 44-man crew. Engineering work already has begun.

Foreign Fishing Off U.S. in November 1968

NORTHWEST ATLANTIC

92 Soviet, Polish, East and West German fishing and support vessels were sighted in early November; only 10 or 12 remained at month's end. The rapid decline may have been caused by 3 severe coastal storms in midmonth.

Soviet: Early in month, most vessels were 20 to 25 miles south of Martha's Vineyard; the rest were on Cultivator Shoals on Georges Bank. Moderate catches of herring were observed. After midmonth, there were only 5 to 7 vessels, scattered widely south from Block Island to Nantucket.

Polish: 19 vessels were sighted. 15 were south of Martha's Vineyard in early November; only 6 or 8 were left at month's end. Moderate catches of herring were observed.

East German: Early in month, 14 vessels were south of Martha's Vineyard; none was seen after mid-November.

West German: Some herring were observed on 17 vessels fishing along northern slopes of Georges Bank. None was sighted after midmonth.

MIDATLANTIC

Between 10 and 12 Soviet vessels were observed 45 to 55 miles southeast of Cape May, N.J., from November 10 to 22.

U.S. TERRITORIAL WATERS

On Nov. 13, during a fierce coastal storm with 100-mile-an-hour winds, some Polish vessels entered U.S. territorial waters without permission. About 10 inside 3-mile limit in Cape Cod Bay were not boarded because of hazardous sea conditions, but these were instructed to leave by sunset; 8 in territorial waters off Block Island and Martha's Vineyard were escorted outside 12-mile limit as winds diminished.

The Coast Guard boarded one vessel off Cape Cod and one off Block Island to advise that these vessels, and others, had failed to notify Coast Guard of entry into territorial waters. Both captains apologized. They said the storm had forced them to seek shelter. Neither had fished.

GULF OF MEXICO & SOUTH ATLANTIC

No sightings were reported.

OFF CALIFORNIA

In mid-November, 4 Soviet vessels were sighted around Channel Islands off Santa Barbara.

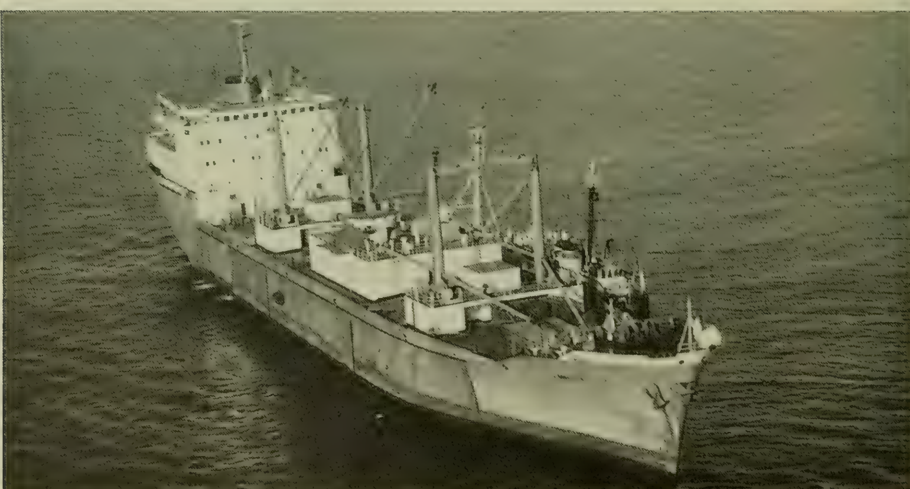


Fig. 1 - The refrigerated transport 'Saianskie Gory' off Anacapa Island in Santa Barbara Channel (northwest of Los Angeles, Calif.) on Nov. 18, 1968. The refrigerator, bought in Sweden in 1965, services vessels of Kamchatka Fisheries Adm.

(Putnam, Calif. State Fish and Game Comm.)

Fig. 2 - Japanese stern trawler underway in heavy swell in Bering Sea.

OFF WASHINGTON & OREGON

20 Soviet vessels, fishing rockfish and hake, were sighted off Oregon.

4 Japanese vessels were reported.

OFF ALASKA

Soviet: Around 30 to 34 vessels fished off Alaska in November 1968. About 16 to 19 fished ocean perch and other groundfish in the Gulf of Alaska; 3 continued ocean perch fishery along Aleutians.

11 medium trawlers--about half north of Fox Islands in eastern Aleutians, the other half along Continental Shelf edge in central Bering Sea--fished pollock, perch, gray cod, sablefish, and flatfish throughout month.

Japanese: About 40 vessels were sighted. In ocean perch fishery, 6 stern trawlers were in eastern Gulf, and 12-13 along Continental Shelf edge in eastern and central Bering Sea.

2 factoryships and 14 trawlers fished Alaska pollock and flatfish for fish-meal, oil, and minced-fish-meat fishery.

About 5 longliners caught sablefish in Gulf of Alaska.

BUREAU OF COMMERCIAL FISHERIES PROGRAMS

Longlining Swordfish Is Commercially Feasible

BCF's research vessel 'David Starr Jordan' returned to San Diego, Calif., on Nov. 23, 1968, with more than a ton of swordfish caught on a 9-day cruise off Baja California. The crew and scientists were joined by 3 commercial fishermen interested in longline fishing for broadbill swordfish.

Cruise Leader Susumu Kato of BCF Fishery-Oceanography Center, La Jolla, explained that the cruise's primary mission was to see how longline fishing, a successful method on the east coast but not used by California fishermen, compares with the traditional harpoon method. Five separate sets consisting of 6 miles of mainline with 400 hooks attached, and baited with squid or mackerel, caught zero to 9 fish per set. The broadbill catch was 20. Two of these were lost: one at the rail, the other by shark damage. Other fish landed included dolphin fish, species of shark, pelagic stingrays, and a turtle.

Fall-Winter Fishery

The cruise results indicate that the catch rate using longline gear is high enough to support a fishery during the late fall and winter when the harpoon fishery is over. Commercial fishing would require more hooks. If adopted, the methods developed by BCF should allow 4 or 5 men to handle daily 15 miles of mainline and 1,000 hooks.

New Device Controls Depth of Fishing Equipment

A depth-controller developed recently for BCF can regulate exactly the depth at which underwater fishing gear will be placed. The depth-controller was fashioned to provide quick, precise, remote control of midwater trawls and other towed gear. A patent was granted Mt. Auburn Research Associates, Inc., Cambridge, Mass. (Serial No. 3,404,655.)

The Device

The new device is a specially designed rotatable cylinder, kept horizontal, and powered by an internal, controllable speed motor. Remotely changing the cylinder's direction and revolution produces either upward or downward lift.

Underwater equipment and fishing gear can be put in place by the cylinders at the depth desired while in operating position.

Sonar Measures Size of Fish Schools in Upper Mixed Layer

It is now possible to measure accurately with sonar the size of fish schools in the upper mixed layers as a ship proceeds at normal speed. This was reported by Dr. Paul Smith, BCF La Jolla, leader of Cruise No. 30 of the 'David Starr Jordan' in the Channel Islands area in fall 1968.

In the past, fish schools at depth have been measured at ship's speed, but Cruise 30 offered the first opportunity to do it in the surface layer. Measurements were taken where high concentrations of anchovy schools had been found.

The Jordan's Sonar

The Jordan's sonar measures the width of fish schools using a receiver control that changes the gain level according to the loss of acoustic power with range in sea water. This control accounts for the divergence of sound waves and the weakening of the sound at each frequency.

Underwater Observation Vehicle Used to Study Fish

Dr. J.R. Hunter, BCF La Jolla, has checked out the underwater observation vehicle 'Sea-See' to see whether it can be used in field studies of the behavior of pelagic-fish schools.

The vehicle is a catamaran powered by diesel engines. It has an observation chamber mounted amidships that can be raised or lowered. The chamber may be lowered to a depth of 10 feet. It has 2 acrylic plastic hemispheres 6 feet in diameter joined by the entrance tube 3 feet in diameter. The chamber, which can seat 2, is equipped with underwater listening devices and other equipment.

Fig. 1 - Sea-See searching for dolphins off California. Vehicle offers 'virtually unrestricted' view of marine mammals and fish.

Here, Sea-See is above water with viewing chamber submerged. The chamber is raised and lowered from central platform around which people are grouped. (Official photographs U.S. Navy)

Fig. 2 - The octagonal underwater viewing chamber.

Fig. 3 - Dolphins photographed from observation capsule.

Jack Mackerel Schools Observed

The Sea-See made three 1-day trips near the Isthmus of Catalina Island. Jack mackerel schools were located on 2 of the 3. Underwater observations were made and photos taken of the schools. Some of the stereophotos taken during the day were good enough for making estimates of interfish distances; these will be compared with measurements made in the La Jolla lab.

Feeding

The schools of about 500 individuals (60-82 mm SL) remained at 5 to 25 feet. Fish fed through the day. Feeding frequencies ranged from 0 in a 1.17-min. interval to 29 feeding snaps in a 0.31-min. interval; the median frequency was 14 snaps per minute. Stomach contents of 4 feeding fish were taken and all were full. One stomach was examined. It contained 1,454 food items; 88% were copepods of 4 genera.

"This preliminary experiment demonstrated that feeding experiments incorporating behavioral observations can be conducted in the field on a pelagic marine fish."

Strobe Photos

Strobe photos were taken at night where schools had been observed during the day. The purpose was to determine if jack mackerel schools continued to school at night. Photos were taken at 1-minute intervals from 5:30-6 p.m. Jack mackerel schools were in many photos. The latest in the evening these schools were photographed was 5:57 p.m., about 8 minutes after end of nautical twilight. The sky was clear but moonless.

"These observations confirmed laboratory findings that jack mackerel are able to school near the surface on a clear moonless night."

Pascagoula Is Building Seawater Lab

BCF's Pascagoula (Miss.) Exploratory Fishing and Gear Research Base is constructing a closed-system seawater laboratory. It will contain an 18-foot-diameter circular pool, a 15-foot rectangular tank, smaller holding tanks, and many aquaria. A saltwater well will provide the water.

Lab's Function

The lab will be used to investigate the behavior of clupeid fishes in relation to fishing gear. The researchers will determine reactions, under controlled conditions, of potentially commercial fishes to artificial stimuli: light, electricity, barriers, and sound.

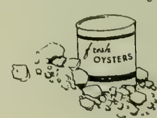
New Package Protects Oysters in Transit

BCF's Seattle (Wash.) Technological Laboratory cooperated with a major oyster cooperative and a container manufacturer to develop a package that will protect fresh oysters from temperature changes during transit.

The shipper wanted to pack 200 pounds of mixed 12-ounce retail cans and 4-lb. institutional cans in the same container. The researchers found that an ordinary telescoping fiberboard container--packed with prechilled oysters and topped with 12 pounds of dry ice--worked well.

Good Results

At an average ambient temperature of 75° F., the temperature of the product did not exceed 45° F. during a 24-hour period. The shipper reported "excellent results." Some shipments arrived at temperatures close to 32° F. Before the new packaging was used, shipments often arrived in poor condition because of excessively high temperatures.



DESTRUCTIVE MARINE ORGANISMS

Mollusks and crustaceans which attack soft rocks, sandstone, and wood are the most destructive of marine organisms. Some have been known to burrow through a lead submarine cable sheeting.

The Teredo (or shipworm), a mollusk that bores into wood for shelter and food, is the worst problem. It enters submerged wooden structures as a larva and grows rapidly to full size (4 to 10 inches long, $\frac{3}{16}$ to $\frac{1}{4}$ inch in diameter).

The Teredo long has been recognized as destructive. Few kinds of wood can withstand its attack. The heartwood of greenheart, a tropical tree, is the only timber that stands up reasonably well around the world. Teak is generally impervious to the Teredo, but is very susceptible in some areas.

There have been many schemes for exterminating the Teredo in infested wooden ships--the most effective is an occasional change of ports. Apparently, the Teredo can live only in water of more than 0.5 percent salt content, and at temperatures ranging between 30° F. and 100° F. The shipworm will die if an infested ship is in fresh water for several days, or beached during cold weather. ("Industrial Bulletin," Arthur D. Little, Inc.).

Fish Oil Research at Seattle Technology Laboratory

Fish oils represent only a small portion of the total U.S. fats and oils market, but they are a significant part of the industrial fishing industry. These oils have been items of commerce for many years. They have been sold on the basis of their general properties as low-priced substitutes for animal and vegetable fats. Over a period of many years, they have become known as a low-quality, inexpensive commodity. The situation still exists today. Before their domestic use in foods was prohibited in the 1930's, a considerable amount of fish oils was manufactured into margarine and shortening. Since then, they have been used as industrial products only. However, about 60 percent of the domestic production of fish oil is exported for manufacture into edible products.

As cheap synthetic and petrochemical compounds began to find their way into areas of industrial application once enjoyed by natural fats and oils, BCF started a research program in 1952 at the Technology Laboratory, Seattle, Wash., to develop new uses for fish oils. Studies of the chemical and physical properties of fish oils were emphasized. Considerable information regarding the characteristics of fish oils was gained. Many new derivatives of fish oils with a wide range of potential applications were prepared.

Research Scope Broadened

The objectives of the program were recently reviewed and the scope of research was broadened. The reason was the development within BCF of a process for manufacturing fish protein concentrate (FPC) that produces potentially high-quality oil as a byproduct. The fish oil research program now includes studies on methods of upgrading the quality of fish oil from FPC processes. The results indicate that the oil is superior in quality to commercial fish oil. The oil from FPC processes should be a good raw material for further refining to a food-grade product, or it can be used as a high-grade raw material for industrial purposes. Use of this oil in food depends on approval by the U.S. Food and Drug Administration.

Several variables that can determine the quality of the final product are being investigated. These include quality changes of the raw material under various holding conditions prior to extraction, and their effects on the final oil; solvent contact time and temperature during extraction; efficiency of solvents in separating the oil from the protein; and recovery of triglycerides free from other lipids and lipid-associated compounds that give rise to undesirable characteristics in fish oils. In studying these problems, the extraction process must not adversely affect the quality of the oil or the protein concentrate, and the economics of the process must be maintained. At the point where a satisfactory product is recovered from an FPC process that can be further refined to meet the requirements of an edible oil, studies on the oxidative stabilization of the oil will begin. This phase will be critically important if an edible-grade fish oil is to be utilized with the polyunsaturation intact.

Edible Fish Oil Uses

Undoubtedly the initial, and probably greatest, application of edible fish oil in the U.S. will be in the margarine and shortening industries. For these purposes, the oil will be hardened by partial hydrogenation. This will also increase the stability of the product toward oxidation. There are other areas where fish oil can be used by the food industry as liquid or solid fats. Also to be considered is the use of fatty derivatives of edible oils as industrial products and as food additives. Research is in progress to prepare surface-active agents that offer special functional properties when incorporated into food or industrial products. Samples of mixed mono- and diglycerides made from fish oils have been distributed to interested segments of the food industry for evaluation as emulsifiers in their products. If the evaluations show promising results, such compounds would enter into competition with similar compounds prepared from edible vegetable and animal fats. The market for this type of emulsifier in the U.S. amounted to 120 million pounds worth $30 million in 1965.

Future investigations will involve more research on fatty derivatives as food additives and industrial chemical intermediates, as well as evaluation of fish oil triglycerides as food fats. Other research subjects are the non-triglyceride lipids and lipid-associated materials that can be separated and recovered from fish oils. The investigations would focus on their potential in food, industrial, and pharmaceutical applications.

--Erich J. Gauglitz Jr., Research Chemist
BCF Technological Laboratory, Seattle, Wash.

This African boy was so hungry that he could not wait for the flour to be baked. The flour was provided by the UN's Food and Agriculture Organization.

For him--and for hundreds of millions of other children around the world who go to bed hungry every night--fish protein concentrate may ensure a better tomorrow.

THE U.S. FISH PROTEIN CONCENTRATE PROGRAM

Roland Finch

The population explosion has led to worldwide nutrition problems. Food production has not kept pace with the rapidly increasing population. Many people, especially in less-developed countries, get less and less to eat every year. Not only is the amount of daily food insufficient, but the quality often is below that needed for proper growth and for leading a full and useful life. In many countries the average diet is low in protein--important in the formation of brain and muscle during the growing process. This affects especially babies and young children, and nursing and pregnant mothers. Protein deficiency has been shown to cause stunted growth and underdeveloped mental capabilities. In extreme cases, it leads to an illness called Kwashiorkor, especially serious in young children, and sometimes it leads to death. Terrible and dramatic evidence of this has been widely published recently in accounts of starvation in Biafra, but it is often not realized that such protein shortage is a daily fact of life in many parts of the world.

A great improvement could be made if more protein were added to the food of undernourished people. This would be especially valuable if the addition could take the form of animal protein. This is not only a very efficient form of protein in itself, but it also has the advantage of increasing the value of the vegetable protein in the food to which it is added.

Nutritionists concerned with the problem have considered many sources of protein. One of the best is fish, which contains 15 to 20 percent of a high-quality animal protein. There is evidence to show that the oceans of the world could provide much more fish than the 60 million tons now harvested each year, and some scientists believe four times as much. Just one-tenth the amount presently unused would, by this estimate, be 18 million tons of fish. This could provide about two ounces of fish containing one-third of an ounce of fish protein daily to the more than 750 million people believed to receive now insufficient protein. Two ounces of fish would not give all the protein needed each day--but would be enough, with the vegetable protein already eaten, to produce marked improvement in a typical protein-deficient diet. Therefore, increasing the world production of fish would seem to be a good way to meet at least a large part of this problem. The difficulty is that fish are often expensive and will only keep for a short time after being caught, especially in the tropics. Less developed countries cannot afford to instal and operate extensive systems of refrigerators, containers, freezers, and transport. In these countries, fish cannot be stored for long or shipped far from the coast. So even if more fish were landed, many people still would be unable to benefit.

FISH PROTEIN CONCENTRATE (FPC): THE CONCEPT

Scientists studied the problem of how to 'stabilize' fish inexpensively so the fish could be stored and shipped without refrigeration. They found that if the water and oil were removed, the remaining product would be largely protein. They called the product fish protein concentrate, or FPC. When properly made, FPC will keep for long periods without being canned, frozen, or otherwise specially treated. There are several ways oil and water can be extracted from fish, and BCF chemists examined these. They decided that one of the simplest and cheapest was to grind up the whole fish and extract the water and oil with isopropyl alcohol--an inexpensive, safe, solvent.

The dried product was a tasteless, odorless powder containing more than 75 percent protein. It could be added to many foods, such as bread, cookies, pasta, tortillas, soups, etc., at a 5- to 10-percent level without affecting appreciably the appearance and flavor. The foods containing FPC looked and tasted almost the same as those without, but the amount and quality of the protein were greatly increased.

Mr. Finch is Director, FPC Project, BCF.

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The next question was the safety of the process. Did the process have any undesirable effects? Extensive chemical and feeding tests using FPC made from hake, first on animals and then on humans, showed FPC to be highly nutritious, as predicted, and free from any side effects. The National Academy of Sciences and the U.S. Food and Drug Administration reviewed the results of these tests and proclaimed FPC wholesome and nutritious.

THE PRACTICAL DEVELOPMENT STAGE

So far, FPC was only a laboratory product. Before it could become a practical reality, it was necessary to determine whether it could be made economically on a large scale. Scientists and engineers at BCF's College Park (Md.) Laboratory, using a model-scale unit, studied the technical problems and developed much basic information needed for larger-scale operation. At this point, BCF hoped that industry would take up the process. But, at meetings and privately, industry representatives said they did not believe sufficient information was yet available to be sure operation on a commercial scale was practical.

Members of the Marine Protein Resource Development Committee of the National Academy of Sciences, who were advising BCF, were concerned about this delay in developing a commercial FPC operation. They recommended that BCF construct a demonstration plant to develop the large-scale application of the process and to prove its feasibility. The plant would give reliable engineering and cost information needed by would-be investors. It also would provide considerable amounts of FPC to the U.S. industry and to the State Department's Agency for International Development (A.I.D.) to explore the best uses of FPC in many countries. And the plant would form a working demonstration center for the U.S. industry and foreign visitors. Several Congressmen became interested in the project. Bills were introduced to construct or lease varying numbers of plants. Different ideas were resolved. In November 1967, Public Law 89-701 authorized funds for BCF to construct an experimental and demonstration plant, to lease another, and to conduct necessary research. When BCF called for bids to construct and operate a plant that would process 50 tons of fish daily, it was found that the $1 million authorized was insufficient. It was hoped that an interested company might make up the difference in cost in return for the opportunity to be first. This did not happen. It became necessary to request Congress to increase the construction authorization. After considerable discussion, the existing law was modified to permit use of part of the funds already authorized for other purposes of the act for construction. In this way, it became possible to construct the plant without increasing the total amount to be spent.

THE FPC DEMONSTRATION PROGRAM

During this time, BCF had been negotiating with bidders to design, construct, and operate the proposed plant. It was considered important that the successful bidder be responsible for all these aspects of the program. On October 21, 1968, a contract was awarded to Ocean Harvesters, Inc., of Los Angeles, Calif. One subsidiary company, SWECO (formerly Southwestern Engineering Co.) will undertake design and construction. The other, Starkist Foods, Inc. (associated with H. J. Heinz Co.) will operate the completed plant.

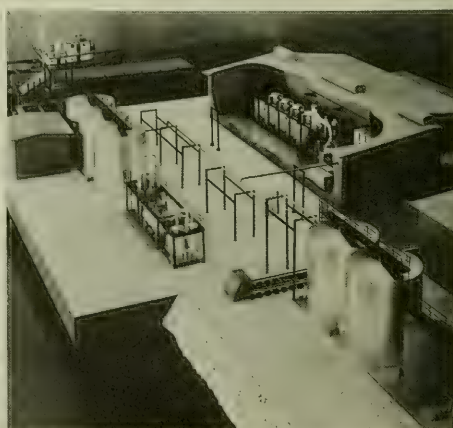


Fig. 1 - Scale model of BCF's FPC Pilot-Demonstration Plant to be built and operated by Ocean Harvesters, Inc., in Grays Harbor, Aberdeen, Wash. When completed, the plant will convert about 50 tons of raw fish a day into 8 tons of FPC.

The first 5 months will be occupied with predesign engineering studies to determine and demonstrate design factors needed in several stages of the operation--raw-fish grinding, deboning, extraction, drying, solvent removal, milling, and recovery of the solvent. Based upon this work, and on results

previously obtained by BCF, a process design will be developed. This amounts to a series of flow sheets that will show exactly the types and sizes of equipment needed, and the flows and balances of materials at each stage. The next step will be plant design, an architectural plan showing dimensions and locations of equipment and building. Figure 1 shows one proposal for the layout, although the final design will not be completed for months. Following design approval, the plant will be constructed at Aberdeen, Wash., on land generously made available by the Port of Grays Harbor. The first start-up operation is due in March 1970. Two months later, after the initial shakedown, the plant will be examined, approved, and accepted by the Government. Ocean Harvesters will continue to operate the plant for 10 months more under the present contract.

THE PROCESS

A simplified outline of the process is shown in Figure 2. The plant will be designed to extract the ground fish with alcohol in stages. To achieve greatest efficiency, it will be a countercurrent system: the alcohol will travel through the stages in the opposite way to the fish. In each stage, the fish (sometimes partly extracted) will be mixed in a large tank with the solvent for a time, then separated. The extracted fish will pass to the next stage--and the solvent will pass in the reverse direction to an earlier stage. The later stages will probably be heated to increase the extraction of oil. The final moist

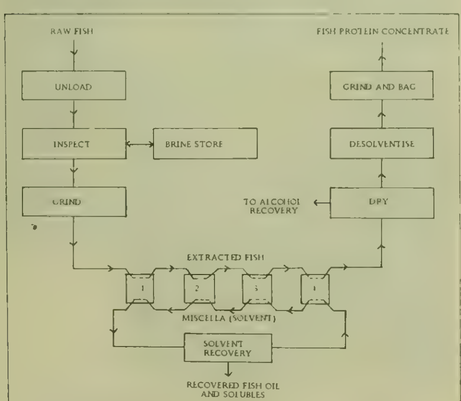


Fig. 2 - Simplified diagram of FPC demonstration plant.

cake of extracted fish will be dried so that most of the isopropyl alcohol can be recovered and reused. A very small amount of remaining alcohol cannot be removed by simple drying and must be driven off by treatment with steam. This process will also remove traces of fishy flavor which may be left in the product. Following this, the dry product will be ground to a very fine powder and filled into 50-pound bags for storage.

The plant will be able to process about 2 tons of fish per hour; this will produce slightly less than one-third ton of FPC. Because it is an experimental plant, it will be run mostly on an 8-hour basis, not continuously as would be necessary in a production operation. However, there will be some periods of continuous running to check the equipment's efficiency under these conditions. A control group of BCF employes will occupy a laboratory in the plant to examine the raw fish, control and measure the product quality, and to collect engineering and other data required for future designs and cost calculations.

THE FISH

The fish used for the first operations will be Pacific hake because only hake and hakelike species can be used for making FPC at present. Data are being collected to further petition the Food and Drug Administration to increase the number of species that may be used to make FPC. So other fish will be used for later runs in the plant to find out what changes, if any, are needed in design and operation to use the plant for different species, especially fatty fish. The use of fatty species, such as menhaden, anchovy, herring and thread herring, has a potential for making FPC at a lower cost than when hake is used. In many parts of the world, they can be landed for less money.

Moreover, experiments have shown it probable that natural oil these species contain in larger amounts can be recovered very cheaply in excellent condition. The oil can be sold to offset the cost of FPC.

Another byproduct is fish solubles, a mixture of soluble proteins, salts, and other compounds used to a limited extent in animal feeding. At present, this is not a high-value material and would not contribute much revenue to the operation.

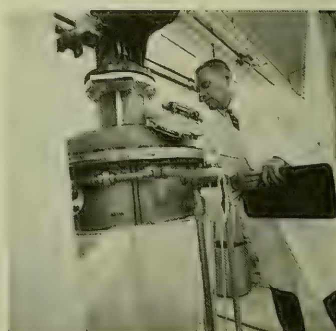
(Contd. p.30)

HOW BCF MADE FPC

GRINDING FISH: Operator drops hake into grinder, which produces . . . . .

. . . . a FISHBURGER.

Fishburger is mixed with alcohol in unheated vessel to remove water and fats (they dissolve in alcohol).



HOT ALCOHOL is used to continue the extraction of fats and moisture from the fish.

Processing of fish is conducted under carefully controlled conditions of time, temperature, and the completeness of each operation.

SEPARATION of solids, which drop into container, from liquids.

DISTILLATION COLUMN recovers alcohol, which is used again.

ROTATING VACUUM DRYER removes virtually all traces of the solvent (alcohol).

FPC

FINE GRINDER reduces fully dried FPC to particle size desired. It is bagged and marked to indicate the different experimental conditions under which it was produced.

All these foods contain FPC.

The FPC made during this demonstration will be available to A.I.D. for use in overseas feeding programs, and to the U.S. food industry for market-development studies. Some will be used in later BCF programs designed to find new and more efficient ways of applying it to foods.

Even when the demonstration program has proved the isopropyl-alcohol method and provided the data needed by industry, much will remain to be done before FPC can become a practical, working reality on the great scale necessary. It will require private investment and industrial experience to develop and operate full-scale production plants. These will have to be capable of processing 200 tons of fish or more daily, and ensuring a supply of high-quality product. Much must be done to develop markets for FPC, by investigating ways it can be fed to protein-deficient people. Some work already is being undertaken by the U.S. food industry and in studies conducted for A.I.D.

But the stage now is set for moving FPC from the laboratory to a full practical demonstration--an important step in bringing fish protein to needy people throughout the world.

DO YOU KNOW?

The scallop shell was the emblem of knights and monks of the Crusades in the ninth and tenth centuries.

Found in the coats-of-arms of many noble European families, the scallop shell may indicate that the bearer's ancestors went on a holy pilgrimage to the shrine of St. James the fisherman in Spain, to the Holy Land, or on a long sea voyage.

The scallop, long a favorite symbol of both writers and painters, appears frequently in literature, song and art. It is mentioned in the works of both the Elizabethan gallant, Sir Walter Raleigh, and the still-popular Sir Walter Scott. Because of its beauty of shape and color, the scallop was represented so often in portraits of the mythical Venus that the name "Venus-cocle" came into common usage in Old English.

The Makah Indians of the U.S. Pacific Northwest used scallop shell rattles in their ceremonial dances. One particularly beautiful specimen of Pacific scallop was an object of worship by natives of some South Pacific islands before the introduction of Christianity.

An oversized muscle called the "eye" enables the scallop to move through the waters and over the ocean floor by snapping its shell together. This nutritious, sweet-flavored muscle is relished by gourmets for its delicate flavor.

BCF conducts research programs on both the giant sea scallop of the North Atlantic and the small calico scallop of the South Atlantic to assure a continued supply of these tasty shellfish for U.S. tables.

--Catherine Criscione

A MACHINE FOR WINDING TRAWL CABLE

Ian E. Ellis

An inexpensive device was developed to facilitate the frequent transfer of steel trawl cable between fishing vessel winches and storage reels. It has three components: reel lifter-stand, axle, and drive unit. The device can be readily transported because it is compact and weighs about 250 pounds.

The reel lifter-stand (Fig. 1) has two frames of schedule No. 40 steel tubing, galvanized after fabrication, and two bearings. The stiffener atop the handle is a 30-inch piece of $\frac{1}{4}$-inch steel plate, which tapers from 1 to 2 inches wide. The bearings are removable and easily replaced. A 2-inch piece of 4-inch outside diameter tube is machined to $2\frac{7}{8}$-inch inside diameter to mate with the bearing surface of the axle. The tubing is then sawed longitudinally to give two semicircular bearings, and each bearing is welded to an 18-inch stem of $1\frac{1}{2}$-inch pipe. The bearing stem is dropped into the riser, open upper end of the lifter-stand. Height of the axle may be adjusted by inserting a pin into holes in the lifter stand.

The axle (Fig. 2) is a 5-foot piece of $2\frac{1}{2}$-inch schedule No. 80 tubing with bearing surfaces machined near the ends. A flange is welded on one end and a drive sprocket bolted to the inside of the flange. The drive arm is a 12-inch piece of 1- by 2-inch steel channel with a slot, butt welded to the axle 7 inches from the sprocket. The slot in the drive arm permits the attachment of different steel reels to the arm by a $\frac{1}{2}$-inch machine bolt. A

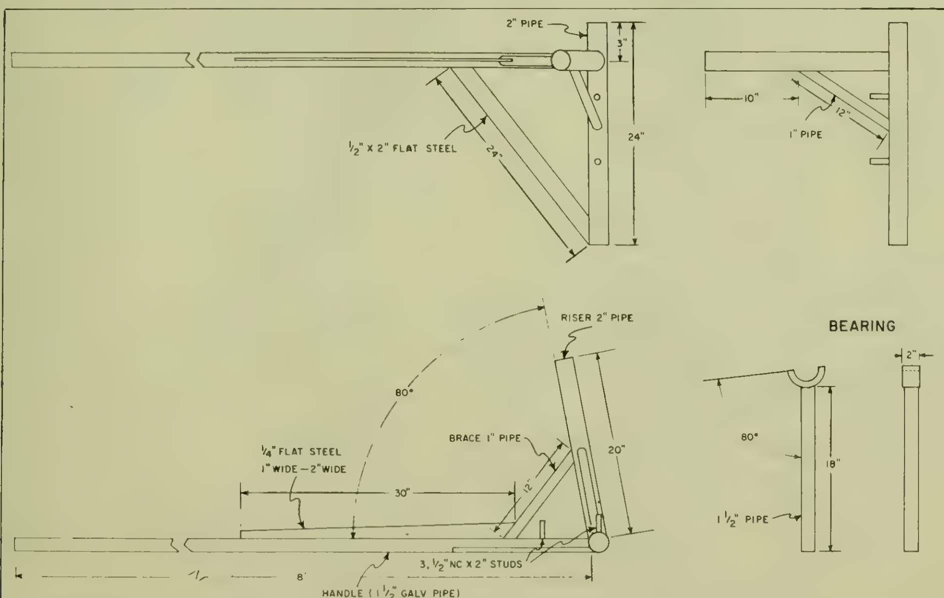


Fig. 1 - Reel lifter stand. Complete unit includes one frame as shown and one mirror image frame.

The author is a Fishery Methods and Equipment Specialist, Exploratory Fishing and Gear Research Base, BCF, 2725 Montlake Blvd. E., Seattle, Wash. 98102.

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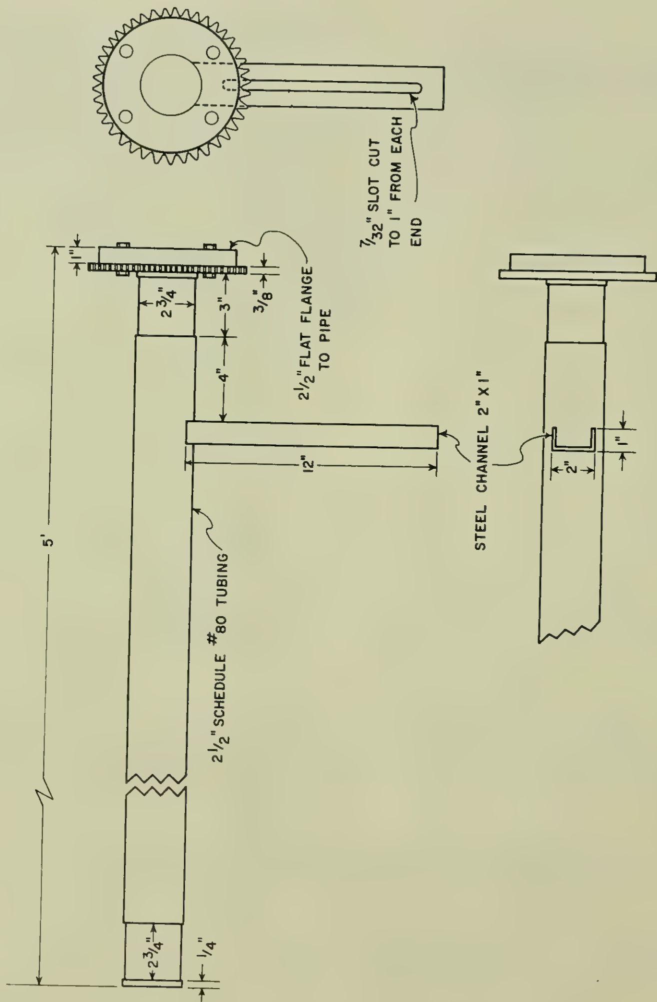
7/32" SLOT CUT
TO 1" FROM EACH
END
1"
3/8"
2 3/4"
3"
4"
2 1/2" FLAT FLANGE
TO PIPE
12"
5'
2 1/2" SCHEDULE #80 TUBING
STEEL CHANNEL 2" X 1"
2"
1"
2 3/4"
1/4"

Fig. 2 - Axle.

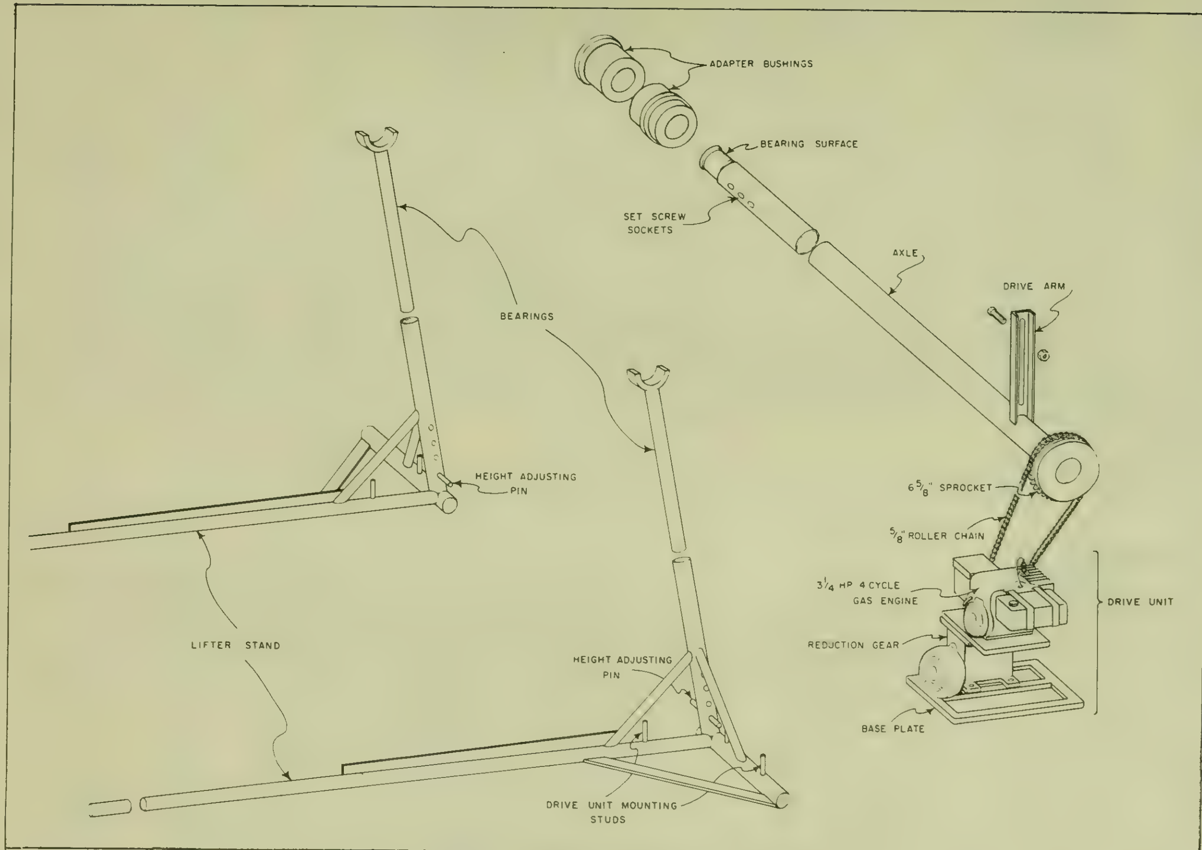

Fig. 3 - Complete assembly for winding cable, exploded view.

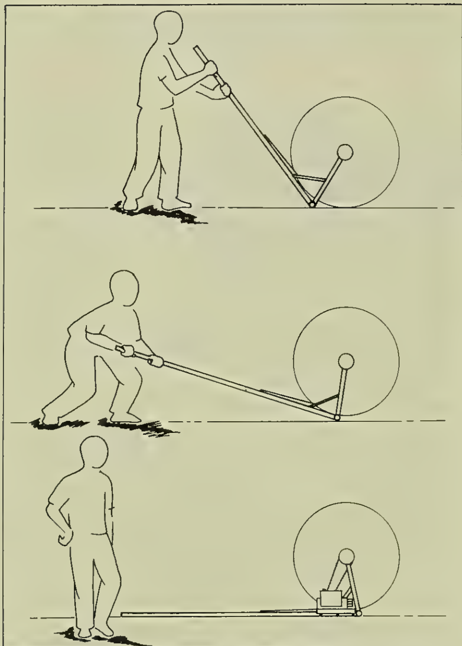

Fig. 4 - How to use the lifter stand: (a) raise handle and place the bearing against the axle; (b) push down on the handle to lift up the reel; (c) device ready to wind cable on to the reel.

wooden reel is turned by the drive arm pushing against a wooden block nailed to the reel flange. Cylindrical or conical adapters are slipped on the axle and case-hardened set screws are tightened in receiver holes in the axle to handle reels needing larger diameter axles.

The drive unit (Fig. 3) is held in place on the lifter-stand by mounting studs and wing nuts. The power source is a $3\frac{1}{4}$ hp., 4-cycle gasoline engine with a factory-installed 6 to 1 reduction gear. The shaft speed is from 300 to 400 r.p.m. The engine drives a 10 to 1 reduction gear through a clutch and V-belt with a 2 to 1 pulley ratio. The reduction gear drives the axle with a $\frac{5}{8}$-inch roller chain over 2 to 1 ratio sprockets. The axle speed is from 7 to 10 r.p.m.

The device can be set up and operated by one or two men. The cable reel is placed facing the block over which the cable will pass. The axle is passed through the reel and the adapter set screws are tightened. The handle of each lifter-stand is raised and the bearing is mated with the bearing surface of the axle (Fig. 4a). The handles are pulled down raising the reel (Fig. 4b, c). The drive unit is set on mounting studs on a lifter stand, the drive chain is put in place and the retaining nuts are tightened until the chain is taut.

This device has been used extensively since construction. The transfer of two 300-fathom sections of $\frac{5}{8}$-inch electrical towing cable from a vessel's winches to storage reels has been accomplished in less than 1 hour. The small size of components and their light weight make handling and storage easy. The machine is quite stable and may be used on rough and cluttered docks. The lifter-stand sometimes slides on a dock when a light reel is under tension, but it is easily realigned.

COMMERCIAL FISHING

"Fishing Boats and Equipment," by John Burgess, 216 pp., illus., 1966. Fishing News (Books) Ltd., London. Realizing the lack of literature on how to set about fishing for a living, Burgess has written a textbook based on information acquired as owner and operator of 6 boats in England and Australia during the last 30 years.

He provides some theoretical knowledge of fisheries, and describes the gear most important to the beginner. Designed to help both commercial fishermen and would-be fishermen, the book covers all important aspects of outfitting a boat for commercial fishing.

FISHING BOATS

"A Guide to Fishing Boats and Their Gear," by Carvel Hall Blair and Willits Dyer Ansel, 142 pp., illus., $5.00, 1968. Cornell Maritime Press, Cambridge, Md. The International Rules of the Road require that "All vessels not engaged in fishing . . . shall, when underway, keep out of the way of vessels engaged in fishing." To keep out of the way of a fishing craft, one must know what type of equipment it is using. Since nets, for instance, are invisible from an approaching ship, one must determine from the looks of a vessel what it is, what it is doing, and what it is likely to do next.

On a very modest scale, this book attempts to do for the world's fishing craft what Jane's or Talbot Booth's does for fighting and merchant ships. Chapter I describes the basic methods of the commercial fisherman and the equipment he uses. Succeeding chapters cover specific types: trawlers, hook and liners, gill netters, seiners, harpooners, support ships, research vessels, and small craft.

SPORTS FISHING

"Fishing From Boats," by Milt Rosko, 272 pp., illus., $6.95, 1968. MacMillan, New York. Rosko tells the fisherman everything he needs to know for successful fishing in coastal waters. He provides detailed information on fishing techniques, tackle, boats, and the species most likely to be found.

OCEANOGRAPHY

"The Ocean World," by Vladimir and Nada Kovalik, 191 pp., illus., 1966. Holiday House, New York. Oceanography is tomorrow's science. More than any other area, including the vast realms of space, it holds the promise of exciting development for the coming generation. This comprehensive, informative, well-written book is calculated to inspire potential oceanographers.

MAN IN THE SEA

"The Deepest Days," by Robert Stenuit, 222 pp., illus., 1966. Coward-McCann, New York. It has become a truism to state that our planet should be called Sea, not Earth, since salt water covers seven-tenths of its surface. Man has circled the moon, but the ocean in which we wade remains virtually unexplored and unexploited. The first major dive combining depth and time--432 feet and 49 hours--was made in June-July 1964, off Berry Island in the Bahamas. Two men made the dive, one the author.

Stenuit describes the preparations for the dive and the dive itself.

MARINE BIOLOGY

"Marine Biology IV: Proceedings of the Fourth International Interdisciplinary Conference," edited by Carl H. Oppenheimer, 485 pp., illus., 1968. Academy of Sciences

Interdisciplinary Communications Program, New York. Growing numbers of scientists are rapidly extending the frontiers of knowledge. From outposts of research, streams of new information pour into already-overloaded communication channels. New methods of investigation lead to increasing specialization. It takes a multidiscipline orientation and multiprofessional teamwork to solve many crucial problems in biology. In the effort to achieve a "breakthrough" in such basic fields as genetics, homeostasis, or growth and development, the researcher may find the needed clue unexpectedly in a new advance in other branches of biology.

This book is the record of an interdisciplinary conference on unresolved problems in marine microbiology.

MARINE MAMMALS

"A List of the Marine Mammals of the World," by Dale W. Rice and Victor B. Scheffer, 16 pp., 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209. This is a list of 117 marine mammals--now living, or which became extinct recently. Their geographic distribution and the systematic status of little-known species are included.

TUNA

"Some Operational Aspects of the Hawaiian Live-Bait Fishery for Skipjack Tunas (Katsuwonus pelamis)," by Vernon E. Brock and Richard N. Uchida, 9 pp., SSR-F No. 574, 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

The skipjack tuna appears to be the major underutilized fishery resource of the central Pacific. It has been estimated to offer minimum potential yields of 140,000 to 225,000 metric tons a year. This study examines the presently modest Hawaiian skipjack fishery and some of the factors limiting it. Their removal, wholly or in part, could lead to the development of a major industry.

SQUID

"The Squid Fishery," by Charles H. Lyles, 19 pp., CFS No. 4833, 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

The value of squid as food has never been fully realized in the U.S. It is high in protein and phosphorus, and delicious when fried and/or baked with stuffing.

Squid support a fishery that averages nearly 16 million pounds a year, worth about $500,000. Mr. Lyles provides historical statistics from 1879-1967, a history of the fishery, and several recipes.

ABALONE

"Feeding Habits of Paua," by B. R. Tunbridge, 18 pp., illus., Technical Report No. 20, 1967. New Zealand Marine Dept., Wellington, N. Z.

Describes the feeding habits of precommercial-size paua, Haliotis iris, in the intertidal zone, during their most rapid growth. Also records the varying quantities of different seaweeds found in their stomachs.

SHARKS

"Sharks, Skates, and Rays," edited by Perry W. Gilbert, Robert F. Mathewson, and David P. Rall, 624 pp., illus., 1967. Johns Hopkins Press, Baltimore, Md. Public interest in sharks has been centered around the shark-hazard problem. It is not the worldwide number of attacks but the publicity given to such incidents that results in economic losses in resort areas. It becomes a morale problem for whole units when some servicemen are attacked. A more effective shark deterrent is needed, but first we need to learn more about the shark's basic biology.

Investigators who work with sharks, skates, and rays are located in widely scattered laboratories, and their reports appear in many journals. An interdisciplinary symposium to review various contributions and techniques was held in Bimini in 1966. This book contains 39 of the papers presented there.

DOLPHINS

"The Dolphin Smile," edited by Eleanore Devine and Martha Clark, 370 pp., illus., $7.95, 1967. MacMillan, New York. Subtitled "29 Centuries of Dolphin Lore," this book is an anthology of the most informative and entertaining fact and fiction about dolphins from Homer to Flipper. Besides the wealth of

literature and lore, there are many articles based on the latest scientific research in dolphinology.

LARVICIDES

"Effects of Lamprey Larvicides on Invertebrates in Streams," by Richard Torblaa, 13 pp., illus., SSR-F No. 752, 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

A program to control the sea lamprey in the Great Lakes with the larvicide TFM, sometimes used with Bayluscide as a synergent, began in 1958. Torblaa examines the effects of these chemicals on aquatic invertebrates in natural streams.

GULF OF MEXICO

"Fishermen's Atlas of Monthly Sea Surface Temperatures for the Gulf of Mexico," by Luis Rivas, 28 maps and 5 text pages, 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

Increasing interest in the fisheries and marine biology of the Gulf of Mexico has created a strong demand for environmental data. Available bottom temperature data are inadequate to prepare a meaningful summary. But the surface temperatures shown in this atlas indicate the trends in the shallower coastal waters and should help fishermen interpret their own temperature observations.

PUERTO RICO

"Inland Game Fishes of Puerto Rico," by Donald S. Erdman, 88 pp., illus., 1967. Dept. of Agriculture, Puerto Rico. Writing primarily for the sports fishermen, Erdman describes the game fishes of the larger reservoirs, rivers, and lagoons. He examines the origins of the inland fishery, and identifies the native and introduced freshwater fishes.

MAPS

Antarctic Map Folio Series, American Geographical Society, Broadway at 156th St., New York, N. Y. 10032:

"Folio 10: Primary Productivity and Benthic Marine Algae of the Antarctic and Subantarctic," by E. Balech, A. Z. El-Sayed, G. Hasle, M. Neushel, and J. S. Zaneveld, 15 plates and 12 text pages, $6, 1968. The folio shows distribution and abundance of the phytoplankton standing crop, the primary organic productivity, and the nutrient chemicals in waters along the paths of research vessels in the Pacific sector of the Antarctic and Subantarctic, the southwest Atlantic, Drake Passage, Weddell Sea, and waters west of the Antarctic Peninsula. Four plates show the circumpolar distribution of selected species of diatoms and dinoflagellates.

"Folio 11: Distribution of Selected Groups of Marine Invertebrates in Waters South of 35° S. latitude," by A. W. H. Bé, et. al., 29 plates and 40 text pages, $10, 1968. The rich waters surrounding Antarctica contain a vast number of marine invertebrates. This folio contains distribution maps of those genera and species about which the most informative data have been collected. An introductory test by Dr. Joel Hedgpeth discusses the general oceanographic setting of the Antarctic, the distribution of bottom communities, and the present status of bipolarity.

--Barbara Lundy

U.S. AND USSR AGREE ANEW ON SOVIET FISHING OFF U.S. MIDATLANTIC COAST

Barbara Lundy

In early December 1968, the U.S. and the USSR signed a new agreement on fisheries off the midatlantic coast of the U.S. It extends and modifies the one originally concluded in November 1967. The U.S. delegation, led by Ambassador Donald L. McKernan, Special Assistant for Fisheries and Wildlife to the Secretary of State, included advisors from sports fishing interests and commercial fishing industries, and state fishery officials from New Jersey, New York, Rhode Island, Massachusetts, and Maine.

The new agreement provides greater protection for scup (porgy), fluke (summer flounder), red hake, and silver hake (whiting), species traditionally of prime interest to U.S. sports and commercial fishing.

Under the 1967 agreement, a rectangular area of several thousand square miles, extending south of Long Island and Rhode Island, was closed to fishing by large vessels during January through March 1968. During the same 3 months for the next 2 years, 1969-1970, the closed area will be an elongated belt, roughly along the 50-100 fathom line, from Rhode Island to Virginia. This area, outside U.S. jurisdiction, encompasses a substantial part of the wintering grounds of all 4 species.

THE AGREEMENT

Under the agreement, large Soviet vessels fishing in the area will continue to restrict their catches of the 4 species to the 1967 level, which was considerably below the 1966 catch. For example, the Soviet catch of red hake declined from 25,722 metric tons in 1966 to 14,884 tons in 1967. Overall Soviet catch in the area declined from 131,075 tons to 47,086. Preliminary Soviet data indicate that her 1968 red-hake catch in the midatlantic area will be about 2,000 tons, and overall catch less than 50,000 tons.

Noting the significant reduction in Soviet fishing effort in the area, the U.S. agreed to permit the Soviet fishing fleet to continue to use 2 small areas within the U.S. 9-mile contiguous fishing zone off New Jersey and Long Island for loading operation; also, the U.S. will permit the Soviets to fish in a small area off Long Island during specified periods during the winter. These areas are unchanged from the 1967 agreement.

U.S.-USSR Joint Research

Scientists using research vessels from the U.S. and the USSR conducted joint surveys and research from the BCF Biological Laboratory at Woods Hole, Mass., in 1968. A number of factors affecting the midatlantic fisheries were evaluated during this cooperative scientific work, which contributed to the successful conclusion of the new agreement.

AMBASSADOR McKERNAN'S VIEW

Ambassador McKernan noted that the change in the area of the closed zone would

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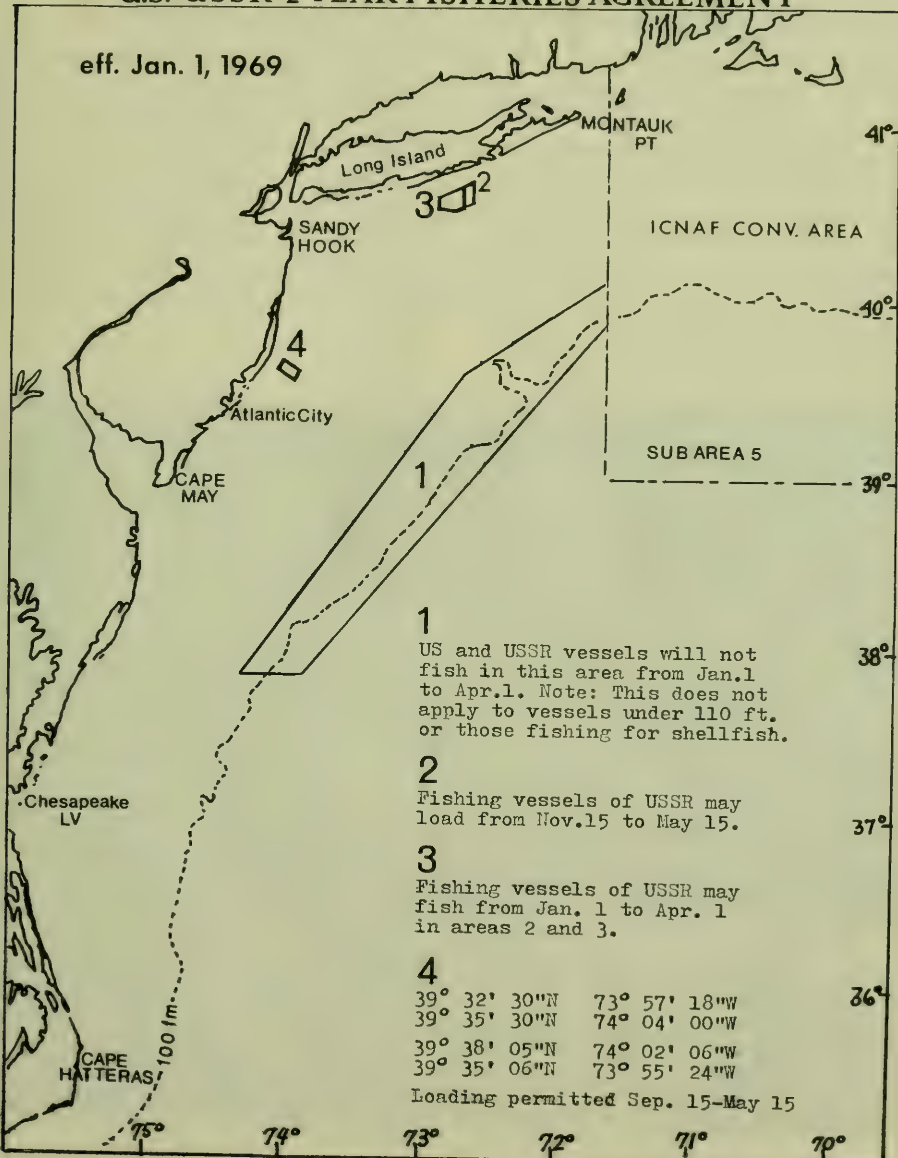
U.S.-USSR 2-YEAR FISHERIES AGREEMENT



especially benefit sports and commercial fishermen of the coastal midatlantic.

He said: "The area to the south, off New Jersey, Maryland, and Virginia, which will be newly closed to fishing by large vessels for 3 months each year, is a particularly important wintering ground for scup and fluke. These species have never been available in large numbers, but recent natural causes as well as heavy fishing pressure have reduced their numbers substantially. Scientific evidence indicates that the red and silver hake situation is now improving, although the abundance of these 2 species is still at a low level compared to the past."

In an interview following the signing, Ambassador McKernan noted gains for U.S. fisheries under the new agreement. He said the new agreement represents an advance in Soviet recognition of U.S. fishery objectives. In his opinion, support of U.S. goals for the protection and conservation of both international and national fisheries has been strengthened. He cited a number of ways in which coastal fisheries have benefited.

V. M. KAMENTSEV (left), First Deputy, Ministry of Fisheries, USSR, and Ambassador DONALD L. McKERNAN sign U.S.-USSR MID-ATLANTIC FISHERIES AGREEMENT attended by experts of the two nations.

• "The first, and most immediate benefit, from the U.S. standpoint," he noted, "is that limitation of fishing on the edge of the Continental Shelf protects stocks of primary concern to American sports and commercial fishermen more fully than before. It so happens that the Soviets are particularly interested in certain species, such as herring, that are presently of little concern to the U.S. Modifying the 1967 agreement allows the Soviets the opportunity of more herring fishing on the high seas. It allows our fishermen this opportunity as well.

• "The second important gain, from the U.S. point of view, is that a much clearer and more comprehensive program can be envisaged," Ambassador McKernan continued. "The Soviets have shown a willingness to cooperate, and to use their research ships to work with the U.S. in developing conservation programs. This cooperation will expand our research capacity without requiring more funds from the U.S. and will increase our knowledge of resources along our coasts. It also will enable us to formulate both national and international conservation programs for all our fishery resources, including those we are not using very much now, but probably will be using much more in a few years, such as herring.

• "Thirdly, the new agreement specifically restricts Soviet fishing on species of importance to us, but of absolutely no concern to them, such as flounder, soles, and flatfishes. We have feared the Soviets were harvesting large quantities of such species as scup and fluke. Although the 1967 agreement indicated they would not take these species, except as incidental to other fisheries, the definition of incidental was not very clear. The new agreement provides new language and new understanding about these fisheries. Incidental catch is explicitly defined; now their interpretation is the same as ours."

One U.S. long-range international fishery policy of particular concern is that some preference must be given to small coastal fishermen obliged to compete for the same stocks of fish with large distant-water fleets, the Ambassador noted. He added: "To a modest extent, and in a somewhat indirect way, the agreement does advance the U.S. policy towards getting recognition by an important fishing state of the concept that the coastal state, in some circumstances, must have preference in harvesting coastal stocks.

"The agreement, from the U.S. point of view, thus serves long-range interests, as well as solving short-term conservation problems of the fisheries of the midatlantic Bight."

U.S. & JAPAN SIGN 2 AGREEMENTS

Representatives of the U.S. and Japan met in Washington, D.C., beginning Nov. 13, 1968, to discuss the future of two agreements: the Eastern Bering Sea King Crab Agreement, signed in 1964 and extended in 1966; and the Agreement of May 9, 1967, concerning Japanese fishing within the U.S. contiguous fishing zone and in adjacent areas off the U.S. Agreements were initialled on December 3. On December 23, 1968, the new arrangements--which will remain in effect until Dec. 31, 1970--were signed by Secretary of State Rusk and Ambassador Shimoda.

King Crab

The new King Crab Agreement provides for a drastic 48-percent reduction in Japan's annual crab production, from 163,000 cases ($\frac{1}{2}$-lb. 48's) to 85,000 cases for 1969 and 1970. This measure is designed to arrest the serious decline in the king crab stocks and to assure that the resource will be available for harvest to U.S. fishermen. The agreement also provides for expansion of the existing pot fishing zone, and for Japan to conduct a prudent fishery for tanner crab.

Fishing Off U.S.

Several major changes were made in the agreement relating to Japanese fishing operations off the U.S. coast. Japan agreed to prohibit its vessels from trawling at night during the first 12 days of the halibut season in an extensive area in Areas 4A and 4B in the eastern Bering Sea. The purpose is to avoid damage to U.S. halibut fixed gear.

Japanese vessels will also refrain from operating in the area landward of the isobath of 110 meters between Grays Harbor and the mouth of the Columbia River (between 46°14' N. latitude and 46°56' N. latitude). This is a popular salmon sportfishing area.

Understanding was also reached on alleviating the fishing pressure on Pacific Ocean perch stocks off Washington and Oregon.

New Loading Zones

In exchange for the Japanese concessions, the U.S. agreed to permit Japanese vessels to conduct loading operations in 3 additional localities. The existing 2 are off Kayak Island and Sanak Island. The new zones are off Forrester Island and near Marmot Island off Afognak Island in the Gulf of Alaska, and off Destruction Island, Washington.

The U.S. delegation was led by Ambassador Donald L. McKernan, Special Assistant to the Secretary for Fish and Wildlife, Department of State. It included Clarence F. Pautzke, Assistant Secretary for Fish and Wildlife, Parks, and Marine Resources, Department of Interior; H. E. Crowther, Director, Wm. M. Terry of BCF; and industry and State officials.

--L. M. Nakatsu

UNDP/FAO Caribbean Project Explores for Snapper

The exploratory fishing vessel 'Calamar' conducted experimental trawl fishing between Trinidad and French Guiana from June 1967 to April 1968. Most of it was done in comparatively shallow waters, less than 20 fathoms, where the bottom was muddy or sandy or both.

Cruises in April-July 1968 extended trawl coverage to greater depths. Below 20 fathoms, the bottom is usually limestone or other calcareous material, so the trawl was fitted with rubber bobbins (rollers).

Gear

The trawls, braided nylon with 4-inch stretched mesh, measured 52 feet on a headline carrying 26 8-inch floats, and 72 feet on a footrope with up to 27 14-20 inch diameter rollers. The 2 x 1 meter (6.6 x 3.3 foot) doors were fished with bridles and ground cables.

Areas and Depths

The principal task was to find areas that might yield snapper. Coverage extended from French Guiana in the east to Tortuga Island, Venezuela, in the west. Over 90% of the 114 trawl drags were made between 20 and 70 fathoms.

Catches

Catches were uniformly low, varying from 41 pounds/hour off Venezuela to 186 off Trinidad. Total marketable catch ranged from 7.1 pounds/hour off Guyana to 67.3 off Trinidad and Tobago. French Guiana yielded the highest percentage of snappers taken--38% of total catch--mostly lane snapper, Lutjanus synagris. The lowest snapper catches (2.6%) were made off Trinidad.

One unexpected catch was a bushel of scallops caught off Margarita Island, Venezuela. Shell width was about 3 inches and meats averaged 65/pint measure. Ordinarily the roller-rigged trawls used at the time would not be expected to take any quantity of scallops.

Other marketable fish caught were jacks (Carangidae), croakers (Sciaenidae), grunts (Pomadasyidae), goatfish (Mullidae), porgys (Sparidae) and, off Trinidad, moonshine (Selene vomer).

Invertebrates found in the catches were sponges, crabs and lobsters, jellyfish, corals, and various molluscs. Industrial species were various small sharks and rays (over 50%), cutlassfish, catfish, lizardfish, batfish, and others.

UN's Caribbean Fishery Development Project

The United Nations has provided the sum of $2,548,000, and 16 participating nations $773,000, to help develop the fisheries of the Caribbean region. FAO is responsible for carrying it out.

The project has 3 objectives: 1) to find pelagic (open-sea) fish and to determine the best methods of catching them; 2) to train fishery officers and fishermen; and 3) to develop fish facilities and marketing techniques.

The first 2 goals may be achieved by the UN vessels 'Calamar,' 'Alcyon,' and 'Fregata.'

The marketing part of the project is being studied by the Economics Section headquartered at Bridgetown, Barbados. UN observers report: "Retail selling in the markets is primitive, packaging generally nil; ice-producing plants are insufficient, and cold chambers generally non-existent." The staff of the Economics Section often tries to persuade governments to invest in fish processing and conservation facilities.

UN specialists believe that government support is vital to balanced development of wholesale and retail marketing. They maintain that facilities to preserve and process fish must be established to even out the temporary gaps between demand and supply.

May Encourage Private Investment

Like other projects of a "pre-investment" character, this UN project aims in the long run to attract private investment capital.

However, to date, only the jumbo-prawn industry has attracted large-scale investment. It came from the U.S. In Guyana, for example, 75 prawning boats provide prawns to a well-equipped processing and freezing plant.

Fig. 1 - The processing plant of the American "Seafoods Guyana Company." Here, jumbo prawns are washed in chilled water. Then they are put in cardboard boxes and stored in cold chambers. Some lots are shelled to meet customers' requirements. Prawns are shipped to U.S. in a refrigerated ship.

Fig. 2 - Fish market at New Amsterdam, Guyana. The fish are snappers and snooks. This market is scheduled to be replaced in a couple of years by a modern center. It will be built with Canadian aid of $185,000.

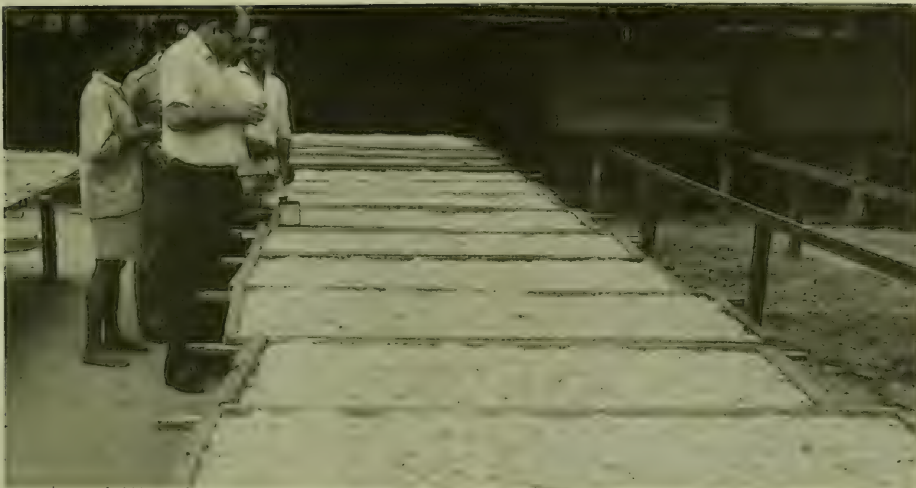


Fig. 3 - M. Lionarons, head of Surinam's Fisheries Department, examines small fish and shrimps drying in a village on Surinam River.

Fig. 4 - The UN vessels have tried live-bait fishing for tunny. To do this, the bait must be caught first. The vessels come into a different anchorage each evening and fish with a blanket net slung from outriggers.

The fish are attracted by a powerful electric light in the traditional technique of Mediterranean lampara fishing. The stick-held blanket net used for fishing for live bait is retrieved by using a small dinghy. The light attracts the fish over the net.

(FAO/H. Menjaud)

Greenland-Faroese Agreement on Fishing Rights

In early October 1968, Faroese fishermen were granted the right to fish in certain areas of Greenland's 3-mile zone and to continue operating their own shore stations to process catches. Such an agreement probably will not be necessary again because June 1967 legislation opened Greenland fisheries to equal entry by all Danish citizens regardless of residence. (U.S. Embassy, Copenhagen, Oct. 1968.)

France Building Shrimp Trawlers for Greece

Evangelistria Fishing Co. of Greece has ordered 2 shrimp trawlers from a French shipyard. They will be about 82 feet long overall, 22 ft. broad, draw slightly over 8 ft., be fitted with 390-hp. main engines and 85-hp. auxiliaries, and have 3,900 cu. ft. freezing holds.

The fully equipped steel trawlers are to be delivered in April 1969. ("Alieia," Sept. 1968.)

Yugoslav Experts Visit Soviet Union

In early 1968, a group of Yugoslav freshwater fishery experts toured Soviet scientific institutes from Leningrad to the Crimea.

They called at the Ukrainian Fisheries Institute at Kiev, which employs about 100 professionals who are studying hybridization, poly-culture, feeding, thermal water culture, etc., and demonstrate the application of new methods.

Extensive Tour

The group also visited the Soviet's largest hatchery at Gorjackii Kliuch, which produces up to 250 million fingerlings a year. At VNIRO, in Moscow, they discussed acclimatization and hybridization studies.

The Belorussian Fisheries Institute at Minsk was included in the tour. Belorussia has the lowest fish prices in the USSR, and earns a 5% return on capital invested in fishery enterprises.

Salmon Tag Returned by Soviet Scientists

A salmon tagged by Oregon Fish Commission biologists off Port Orford in September 1967 was captured on the high seas north of Heceta Bank, about 33 miles off the Alsea River mouth, by the Soviet research vessel 'Oghon' on August 8, 1968. The tag and pertinent biological information were forwarded to the Commission's Astoria research headquarters by the Pacific Research Institute of Fisheries and Oceanography in Vladivostock.

The Oghon has conducted extensive fishery research off the U.S. Pacific coast and has been a regular visitor off Oregon in recent years.

The Oregon State Fisheries director said the Soviet report of the tag recovery is in keeping with current exchanges of scientific information between U.S. and Soviet fisheries biologists.

EEC Fisheries Policy Still in 'Proposed' Stage

The European Parliament generally endorsed the European Economic Community (EEC) Common Fisheries Policy on Oct. 24-25, 1968. The Parliament, an advisory body within EEC, must be consulted on all EEC actions. Power of approval, however, lies with the Council of Ministers, and they have not taken final action. Therefore, the EEC Common Fisheries Policy is still only "proposed." Endorsement by the European Parliament is important in that it reflects the general feeling of countries concerned.

EUROPE

West Germany

GOVERNMENT SUPPORT FOR FISHING INDUSTRY CHANGED IN 1968

Government support for the fishing industry changed significantly in 1968. Total outright aid increased 1.7% to about DM 30.2 million (DM 4.004 = US$1). Because unspent funds from previous appropriations were available, aid granted on a loan basis was reduced from DM 12.2 million in 1967 to DM 1.7 million in 1968. However, the government was permitted to make advance commitments of up to DM 4.5 million.

Subsidies on diesel fuel used by luggers and cutters, granted since 1951 and totaling DM 2.7 million in 1967, were discontinued in 1968.

Exvessel Subsidies Replaced

Structural and consolidation aid increased from DM 7 million to DM 9 million; it was granted under a new policy in 1968. Previous support had been given through exvessel subsidies based on quantity, type, and grade of fish landed. This was discontinued, although money was provided to cover commitments made under the old system.

The 1968 appropriation was simply the first part of a 3-year DM 27 million program. Approximately DM 16.6 million will be used to help scrap 30 trawlers, 26 luggers, and about 200 cutters. Scrapping premiums will be allowed at the rate of DM 400 per gross ton for trawlers, and DM 600 per gross ton for luggers and cutters.

The remaining amount, slightly over DM 10 million, was slated to be used to: (1) convert "fresh fish" trawlers to partial or full freezer trawlers; (2) instal fish-meal plants on stern trawlers; (3) instal mechanical fish discharging devices on fishing vessels; (4) construct cutters with a minimum overall length of 36 feet, and (5) establish producer organizations.

Research and Service Vessels

Nearly 4.6 million marks were provided to complete a vessel for policing and protecting fisheries. A small sum was appropriated to begin planning a new research vessel.

Loan Aid

No provision was made in 1968 for new construction loans for trawlers and luggers because previous appropriations had not been fully used. The DM 4.5 million authorized for this will not be disbursed until 1969. Loans, not to exceed 25% of the total cost of a vessel, will be a maximum DM 1.5 million per vessel. Minimum interest on the 14-year loans will be 4%.

Government-Controlled Sales Promotion

After August 1, 1968, the legally required contributions from the fishing industry, dealers, and importers for fish sales promotion were increased to DM 0.20 per 100 kilograms. The fishing industry has promised to contribute additional funds to the joint advertising fund now that dealers and importers must contribute more.

Denmark

RED TIDE KILLS MARINE LIFE ON WEST COAST

In early October 1968, dead and dying fish, birds, and marine invertebrates were found along Denmark's west coast from Hirtshals to Esbjerg. Fishermen were especially concerned because of the large number of dead cod. Danish Fisheries and Marine Research Division biologists found a bloom of 'Gymnodinium,' the minute toxin-producing alga that caused the red tide off Florida several years ago. This was the first time this type of alga had been found in North Sea plankton samples. By mid-October, die-off reports had stopped. The algal bloom had developed under abnormally warm and calm conditions. With the arrival of cooler weather and some wind, it appeared to peak and then decline. Although many fish died, biologists believe no great catastrophe occurred.

Mussels Unaffected

During October, a large blue mussel (Mytilus edilus) fishery normally begins in the

Denmark (Contd.):

southern part of the affected area. Countless tests of mussels from the area showed no indication of toxicity, allaying doubts that they were unsafe to eat.

Eel Mortality Caused by 'Red Sickness'

Eel mortality was high in 1968. Heaviest loss was in the western part of the Limfjord, very close to the North Sea coast where dead fish had been observed. This raised speculation that the same causative agent was involved. The biologists said, however, that the eel loss resulted from an especially virulent attack of 'red sickness,' a common eel disease caused by a well-known bacterium, and that eel mortality was unrelated to the red tide. (U.S. Embassy, Copenhagen, Oct. 16, 1968.)

Netherlands

FIRM MARKETS
NEW SHRIMP PEELER

A new shrimp-peeling machine that handdles about one a second is being marketed by N. V. Maschinenfabriek, B & S Bedrievjen, v.d. Woerdt, Hengolo. It separates the shrimp and turns them in the right direction for peeling. Spoiled shrimp, or those not turning in the proper direction, are rejected and returned to the supply hopper, or carried out on a separate conveyor belt. This leaves only the best shrimp to be processed under the most hygienic conditions.

Designed for 'Crangon'

The machine was designed specifically for 'Crangon,' small brown shrimp processed in large quantities in the Netherlands. It also may be used for the small northern shrimp, Pandalus borealis. (U. S. Embassy, Copenhagen, Nov. 1968.)

Norway

CANNED FISH PRODUCTION
AND STOCKS

The brisling season normally ends about mid-October. In fall 1968, fishing was not good, and the final 1968 pack was expected to be below average. Because of a fairly good carryover from the previous season, stocks may last until the 1969 pack is available, but this can vary from firm to firm. Exports were at about the 1967 level.

Sild Sardine Supply Unsatisfactory

Sild sardine supplies were not satisfactory, either in quantity or size. Exports exceeded production, depleting stocks about 3%. September 1968 stocks were expected to last about 3 to 4 months, but some items were in short supply. The main packing season should have built stocks gradually over the next months, maintaining supplies through the closed season beginning Feb. 1, 1969.

Kipper Situation Desperate

The kipper situation was desperate; stocks were nearly exhausted. Normal packing was still about 5 months away; shelf space and distribution would be lost in practically all markets, unless stocks could be replenished from North Sea herring in the meantime.

Anchovy Production Delayed

Anchovy production should have started by September, the normal period, but manufacturers deliberately delayed because the unusually mild weather would have caused premature ripening.

Crab Production Low

Crab production was still below 1967's pack at the same time. High temperatures and smooth seas were partly responsible for poor catches.

Insufficient Herring

Unfavorable weather hampered Iceland herring fishing, and landings were insufficient to cover requirements.

Mackerel Catches Good

Mackerel catch was very good. Mackerel production during first-half 1968 amounted to about 50,000 cases, slightly below 1967. The main packing season is in autumn. An estimate of 1968 production will be available at year's end. ("Norwegian Canners Export Journal," Oct. 1968.)

USSR

SCHEDULES FISHERY RESEARCH THROUGH 1975

The Soviet Academy of Sciences' Scientific Council on Hydrobiology, Ichthyology, and Exploitation of Biological Resources of Water Bodies met in Moscow in early 1968. The Ichthyology Commission of the Fisheries Ministry and the Hydrobiological Society held sessions at the same time. This large gathering of fishery scientists planned industrial and scientific research projects as far ahead as 1975.

Research Planned

The Council planned coordinated research for the biological use of natural and technological warm waters. The scientists discussed the future of biological exploration in the Black Sea; underwater hydrobiological exploration in the Barents Sea and Antarctica; artificial breeding of marine organisms; research on technical hydrobiology (protection against encrusting organisms, woodborers, and other harmful organisms); water pollution in Lake Baikal; and fresh water in Siberia.

Research Projects

The Ichthyology Commission submitted these research projects: (1) coordination of scientific fisheries research for 1966-1970; (2) biological research on inland fisheries for 1968-1970; (3) research on the development and exploitation of warm water fisheries for 1968-1970; (4) research plan for increasing the productivity of inland water bodies for 1970-1975. The Central Administration for Inland Fishing and Fish Culture and the Ichthyology Commission have developed a research project on the acclimatization of fish and invertebrates in inland waters.

P. A. Moiseev, of the Research Institute of Fisheries and Oceanology (VNIRO), reported on ocean fishery resources. He estimated the present annual yield at about 60 million tons. He feels that it could be 90 million, if pelagic fisheries are expanded, and insists that any further expansion of Soviet high-seas fisheries must be based on this. ("Voprosy Ikhtiologii," 1968.)

Iceland

CURRENCY DEVALUED AGAIN IN 1968

On Nov. 11, 1968, Iceland devalued the kronur by 35.2%. The U.S. dollar is now worth 88 kronur. The reason given for devaluation was that exports had decreased 45% since 1966 because of falling world prices for fish products--mainly herring oil and meal.

United Kingdom

U.K. PUTS 10% TARIFF ON FROZEN-FISH FILLETS

On Nov. 6, 1968, Britain announced a 10% tariff on frozen-fish fillet imports from European Free Trade Association (EFTA) countries. The government was concerned about pressure on the domestic market caused by the growth of these imports. Austria, Denmark, Portugal, Norway, Sweden, Switzerland, and the U. K. are EFTA members. (Reuters, Nov. 6, 1968.)

St. Pierre-et-Miquelon

Fish Market Deteriorates

A general deterioration of the fish market has seriously affected the economy of St. Pierre-et-Miquelon. Fishermen's subsidies will have to be increased, though the entire industry already is subsidized.

The US$20 million transshipment port construction, including dredging the harbor bottom to 20 feet below its present level, is expected to take 2 or 3 years. Because all heavy building equipment must be shipped in from Canada, and rented for dollar currencies, construction has been very slow.

Shellfish left on a beach in Southern Chile. They must be well closed and alive when harvested. They are raked often to prevent them from burrowing down and escaping. (FAO/S. Larrain)

LATIN AMERICA

Mexico

MEXICAN-SPANISH COD-FISHING VENTURE IN NORTHWEST ATLANTIC

Two Spanish vessels have landed the first 'bacalao,' or salt cod, caught in the Northwest Atlantic under a Spanish-Mexican agreement. Five hundred tons arrived at the Gulf port of Coatzacoalcos in late October 1968. Mexico hopes her own vessels eventually will produce enough salt cod to replace traditional imports from Norway and other countries.

Local & Foreign Markets

Several months ago, 'Empresa Bacaladera Mexicana, S.A.,' a Mexican company financed largely by Spanish capital, built a 4-million-peso (US$320,000) processing plant at San Bartolo, Naucalpan, near Mexico City. The plant will clean, cut, and finish drying the salt cod landed. At first, the bacalao would be distributed only in Mexico. After Christmas, when it is in great demand, it was to be exported to other Latin American countries. Direct production of salt cod by Mexican-based vessels should cut about 25% from the traditional price of 35 pesos per kilo (US$1.27 a lb.).

The two vessels, manned by Spanish crews on the first trip, took 5 Mexican fishermen each on a second. If Empresa Bacaladera exercises its 1-year option to buy the vessels, they probably will have all-Mexican crews within two years. (U.S. Embassy, Mexico, Nov. 6, 1968.)

Peru

BUILDS FIBERGLASS PURSE SEINERS

Five 93-foot, 440-ton-capacity, fiberglass purse seiners are being built by Maestranza y Astillero Delta, S.A., Callao, and Dynamarc Corp., Costa Mesa, Calif. They will catch anchovy for the fish-meal industry. More may be built, depending on the success of the first 5. Dynamarc personnel are in Peru supervising construction. (U.S. Embassy, Lima, Nov. 1968.)

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Cuba

INCREASES FISHING FLEET

East Germany is building 5 Atlantik-class stern trawlers for Cuba; the first was scheduled to be delivered by the end of 1968. East Germany is building 15 other stern trawlers, 45 meters (147.6 ft.) with 7-metric-tons-a-day fish-meal production capacity; 5 will be delivered in 1969, 10 in 1970. Two 550-ton hold capacity freezer barges will be delivered by 1970.

Most of the 90 fishing vessels Cuba has ordered from Spain should be operating in 1970. Three freezer trawlers were delivered in 1968.

Fleet Landings

All the vessels will join 'Flota Cubana,' Cuba's high-seas fishing fleet. Fleet landings increased from 5,200 tons in 1966 to 20,100 tons in 1967. Catch was expected to reach 26,000 tons in 1968, and it is expected to rise to 40,000 in 1970.

New Fishing Methods

Cuba has been testing new fishing methods in the Gulf of Mexico. Daily catches up to 10 tons have been made fishing sardines with electric lights and dragnets. Commercial-scale purse seining is planned for 1969. Catches will be transferred to special vessels at sea, so factory ships will not have to return to port every 12 to 15 days when holds are full.

Fish-Meal Production

Cuba plans to expand fish-meal production in 1969. Two plants will be built, one of these in Cienfuegos.

Chile

FISHERIES SCHOOL SPURS DEVELOPMENT

Chile's Fisheries Development Institute is playing an important role in providing the technical background necessary to develop the nation's fisheries. The work of the

Chile (Contd.):

UN-supported institute covers all aspects of the fishing industry: Northern Chile--anchoveta; Central--demersal fish; and Southern--shellfish.

Figs. 1 & 2 - At Pueito Montt, Southern Chile, fishermen pull their boats up on the beach so villagers can buy the fresh fish over the side.

Fig. 3 - Fisherman brings tuna catch ashore from small boat. (FAO/S. Larrain)

In Southern Chile, the institute concentrates on the problems of catching, storage, and shipment to markets.

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COST OF SHIPPING FISH MEAL TO U.S. RISES

On Jan. 1, 1969, the cost of shipping fish meal from northern Chile to U.S. and Canadian west coast ports went up $4 a metric ton, unless exporters were able to find cheaper means of loading. Shippers may pay $36 a ton, or load the meal themselves and pay $29 a ton. Rates for Peruvian shipments to west coast ports are unchanged, and rates to U.S. Atlantic and Gulf ports are not affected. A U.S. handling charge of $3.60 a ton applies to all meal shipped to west coast ports; handling costs are absorbed in shipments to Gulf and Atlantic ports.

High Loading Costs Responsible

The new rate replaces a hotly contested one. The latter was set by the Latin American Pacific Coast Steamship Conference on Sept. 7, 1968. The Conference raised the rate to $36 a ton, without giving exporters the chance to arrange their own loading. Chilean fishmeal exporters claimed discrimination because Peruvian rates were not increased.

Chile (Contd.):

Carriers claimed higher loading costs in Chile--about $7 a ton, compared to $2.60 in Peru--necessitated the increase. The U.S. Federal Maritime Commission has approved the new rate.

British Honduras

THE FISHING INDUSTRY

The entire coast of British Honduras is sheltered by a series of reefs, keys, and islands that form a barrier reef second in size only to the Great Barrier Reef of Australia. Surrounded by waters rich in marine life, the people of British Honduras have a long and renowned tradition of seamanship, fishing, and boat building.

There are 2 fisheries: the traditional one supplying the domestic market, and the export fishery less than 10 years old. For the most part, they depend on the same fishermen and boats.

The domestic market is supplied by a fleet of small sailing boats fishing principally with hook and line. Many have outboard motors, a few are inboard powered. Catches are landed at the public markets in Belize City, and other coastal and island towns, or sold directly to the consumer on the beach or at wharves. The most popular species are snappers and groupers. Fish is much more important in the local diet than it is in neighboring countries.

Spiny Lobster Fishery

Spiny lobster, the first export fishery developed, is still the most important. The fishery is regulated strictly with seasonal catch limits, closed seasons, and gear restrictions. A tagging program has been instituted, and tag returns have begun to show a migration pattern. Fishermen keep detailed log books showing their daily catches.

Lobsters are taken by 3 methods: The most important is the lobster trap. An unusual derivative of the trap--an old oil drum modified by a sort of fyke entrance built in one end--is fairly common. A fyke is a long bag fish net. No bait is used. The lobsters apparently enter in search of a dark hiding place. The third method is skin diving with spears or gaffs. A few lobsters are taken with dip nets and night lights.

Shrimp Fishery

A shrimp export fishery began in 1966, when good resources, principally pink shrimp, were discovered by a Republic of Honduras-based company doing exploratory fishing. Granted a permit to operate in British Honduras, the company is building a packing plant in Big Creek. The company is served by 6 privately owned trawlers. All are U.S. flag vessels licensed to fish in the Republic of Honduras. During 1966 and 1967, the trawlers operated from Guanaja, Honduras, and transported their catches to a temporary plant in Belize City. The shrimp, packed in the usual 5-pound cartons, are not sorted for size until they arrive in the U.S. Fin fish also are packed and frozen, either whole or as fillets. When the Big Creek plant is completed, the Belize City plant will continue to pack fin fish.

The best season for shrimp is during the first few months of the year; it declines after May.

Exports of Fishery Products From British Honduras

	Pounds Exported				
	1963	1964	1965	1966	1967 (Prelim.)
Lobster Tails, Frozen.	345,361	403,000	431,500	387,900	316,610
Conch Meat, Frozen.	86,310	120,900	78,900	135,900	376,350
Fish, Frozen . . .	167,892	64,600	111,000	162,900	258,397
Fish, Dry salted, Smoked	71,123	31,900	49,300	46,000	46,606
Shrimp, Frozen . .	-	-	-	23,100	225,301

Most of the dry, salted, and smoked fish is exported to Guatemala and Honduras; practically everything else goes to the U.S. Lobster exports have leveled off, even declined, but recently opened operations on the southern coast should increase shipments. The rapid increases in frozen fish and conch exports are expected to continue to the point where they will exceed lobster on a volume basis. However, the extremely high prices commanded by lobster tails will keep them in first place in value for a long time to come, unless the rapidly developing shrimp fishery, also based on a high-priced product, continues to grow.

British Honduras (Contd.):

Sport Fishing

Tourism is expanding in British Honduras. Much of the attraction lies in calm, protected waters that teem with game fish and are among the clearest diving waters in the world. Several small hotels on the keys cater to fishermen and skin divers and operate boats for their use. In Belize City, several boats operated by former commercial fishermen make regular sport-fishing trips. These well-outfitted boats offer something that cannot be matched in most places--a guarantee that customers will catch fish every day.

Scientific Research

The Fisheries Section of the Department of Agriculture is responsible for development and conservation of the fisheries. Like its counterparts in other Caribbean countries, it is undermanned. However, FAO has supplied a biologist and a technologist in recent years. A fishery research vessel is being built in a local boatyard with a grant from the British government. The 36-foot 'Panilurus Argus,' named for the most common species of spiny lobster, was scheduled to be completed in 1968. The Bliss Foundation has provided a Marine Biological Station on the sea front in Belize City.

British Honduras is a fertile field for every kind of marine research. Real opportunities await qualified scientists who wish to pioneer in tropical research under excellent working conditions.

WHAT IS THE CONTINENTAL SHELF ?

Officially, United States laws define the continental shelves as the seaward extension of the coast to a depth of 600 feet; this limit is set for the purpose of granting mineral rights, including oil drilling. The edge of the continental shelf, where the bottom begins to slope steeply, most commonly is found at depths between 360 and 480 feet.

At the time the shelf received its name, it was thought to be essentially flat; now geologists know that the continental shelf has basins, ridges, and deep canyons. Compared to the deeper ocean floor, however, the relief is gentle; hills and basins on the shelf usually do not exceed 60 feet.

The continental shelf width varies from practically nothing to several hundred miles. The shelf along the east coast of the United States is many times wider than that along the west coast. If all the continental shelves of the world are included, the average width is approximately 40 miles.

The shelf slopes gently, at an average drop of 12 feet per mile, from the shore to the continental slope. In contrast, the grade of continental slopes is 100 to 500 feet per mile.

About 7 percent of the ocean is underlain by continental shelves. These are the areas where intensive mineral exploration is now being conducted. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

ASIA

Japan

COLD STORAGES ARE PLANNED TO STEADY TUNA PRICES

The Federation of Japan Tuna Fisheries Cooperative Associations (NIKKATSUREN) has agreed to build and operate cold storages at the tuna ports of Yaizu, Chimizu, and Misaki to support tuna price stabilization. Tuna, primarily yellowfin, will be stored when the domestic market is oversupplied and be released when the market improves.

Two methods have been proposed: one is to store catches on a consignment basis, the other to purchase them. In the case of consignment, NIKKATSUREN would obtain government loans for vessel owners to defray operating expenses until the catches were sold. At Yaizu, small cold storages will be built at first and operated experimentally for one or two years. ("Suisancho Nippo," Nov. 16, 1968.)

* * *

FACES COMPETITION FROM NEW U.S. TUNA PRODUCT

The tuna industry is concerned with the growing penetration of its U.S. canned-tuna-in-brine market by a new U.S. product--canned tuna in vegetable broth. The U.S. packer, who began marketing it in summer 1968, has conducted extensive promotional sales in Chicago and Philadelphia, two major consumer centers for the Japanese product. The packer is planning to expand sales in New England, another major Japanese market.

Threat to Market

The Japanese interpret this as an attempt to win over their canned-tuna-in-brine consumers. Japanese packers would not be able to compete with large U.S. promotional sales, and trading firms could not keep selling at loss just to retain their U.S. market. ("Suisan Tsushin," Nov. 7, 1968.)

* * *

U.S. REJECTS MORE YELLOWFIN TUNA

The Japan Frozen Foods Exporters Assoc. is trying to cope with increasing U.S. rejections of frozen yellowfin tuna. During October 1968, U.S. packers rejected over 600 tons because of greenness or darkness in the meat after cooking. Japanese shippers had already lost more than US$278,000. The claims, running as high as 45% of shipments and averaging 13%, were the second highest since 1959. Then, U.S. packers rejected 40% of Japanese shipments from west Africa. Claims of 3-5% are usually settled between shipper and packer. Because of the enormous quantities rejected recently, and heavy losses suffered by Japanese suppliers, the Association planned to contact California canners to discuss use of green meat and settlements of claims.

Green Meat

In recent shipments, green meat was found primarily in large yellowfin tuna (over 100 lbs.) from the western Indian Ocean. While export tuna are inspected in Japan, fish taken in different areas become mixed in the shipments, making sampling very difficult. The Japan Frozen Food Inspection Corp. has developed a method of predetermining which tuna are likely to develop green or dark meat. It is reported to be 100% accurate, but problems still exist because 4-5 workers need an entire day to test 100 fish. ("Suisan Keizai Shimbun," Nov. 13, 1968.)

* * *

ADVISES FIRM NOT TO FISH E. PACIFIC YELLOWFIN TUNA

The Fisheries Agency has decided not to license Taiyo Fishing Co.'s purse seiner 'Hayabusa Maru No. 3' (275 gross tons) to fish in the eastern Pacific yellowfin tuna regulatory area. Taiyo had planned to send the vessel before the end of 1968. The Agency refused because purse seining there would have created excessive competition with longliners already fishing there. Introducing purse seiners into the regulatory area would have required Japanese participation in the Inter-American Tropical Tuna Commission as a member rather than observer. And, purse seining would have increased Japanese

Japan (Contd.):

tuna catch in the eastern Pacific, substantially affecting export prices--and perhaps led to U.S. imposition of quantitative restrictions on Japanese tuna imports.

Taiyo Will Appeal

The ban was not issued as a mandatory measure. It advised Taiyo not to send Hayabusa Maru while the Agency was studying Japan's distant-water purse-seine fishery. Some industry observers claimed that the Foreign Ministry, sensing considerable U.S. uneasiness over the planned entry, recommended the Agency's action. Despite the advice, Taiyo and several other firms plan to appeal for early authorization to purse seine in the area. ("Katsuo-maguro Tsushin," Nov. 21, 1968.)

* * *

YAIZU FISH LANDINGS DECLINE

In October 1968, landings at the major tuna port of Yaizu totaled 9,528 metric tons worth US$5.11 million. This was a drop from Oct. 1967 of 1,048 tons, or 10% in quantity, and $377,000 in value. Landings of all tuna species fell. Jan.-Oct. 1968 landings were 12,855 tons worth $54.6 million. ("Kanzume Nippo," Nov. 11, 1968.)

* * *

PRICE OF SAURY FOR BAIT SOARS

A steadily shrinking saury catch pushed bait saury prices up to US$554-580 a short ton at Misaki in early October 1968. Bait saury prices averaged around $328 a ton for 12 count per kilo (2.2 lbs.). Outside of crew expenses, the cost of bait was the largest operating expense for Misaki-based tuna vessels.

Good Bait

Saury is good tuna bait because of its odor and blue glow. But the high cost and small size--around 15 count--available for bait may force longline operators to substitute less expensive squid and mackerel. Tuna fishermen are very particular about bait quality. Some will leave a boat if the owner has not bought enough good saury for a trip. The use of less desirable bait could cause disputes between vessel owners and crews. ("Suisan Keizai Shimbun," Nov. 20, 1968.)

* * *

SAURY CATCH DROPS TO RECORD LOW

The saury fishery started well in early August 1968 but began to slow after September. It was feared that the 1968 catch might drop to an unprecedented low. By the end of October, catch was 113,379 metric tons, down about 59,000 tons from the 1967 period. This was about one month's catch in 1962, when landings peaked at 483,000 tons.

150,000 Tons in 1968

The 1968 season's total catch should be around 150,000 tons, compared with 210,000 in 1967. This sharp decline created a severe bait saury shortage for tuna fishermen and pushed prices up around US$128 a short ton in one month. Canned saury production also was expected to sink to a record low in 1968. ("Kanzume Nippo," Nov. 11, 1968.)

* * *

RESEARCH VESSEL TRAWLS OFF PERU AND CHILE

The 2,539-gross-ton research vessel 'Kaiyo Maru' departed Japan Nov. 5, 1968, on an exploratory cruise to the waters off Peru and Chile. Her purpose is to investigate the region's potential for trawling. Fourteen scientists, headed by Dr. Doi, Tokai Regional Fisheries Research Laboratory, were aboard.

The vessel was scheduled to call at Honolulu, depart there Nov. 20, and trawl off Callao, Peru. A call at Valparaiso, Chile, around mid-January 1969 was scheduled before trawling off Chile. Then the vessel will proceed to Papeete, Tahiti, about Feb. 26, 1969, to collect specimens with a set net and fish for tuna with a seine net. She will return to Tokyo March 17, 1969. ("Suisan Keizai Shimbun," Nov. 7, 1968.)

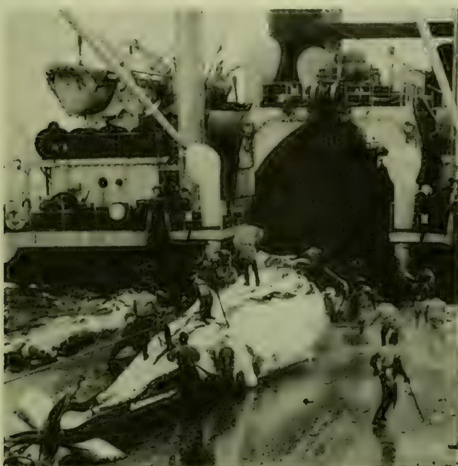
* * *

SENDS WHALING FLEETS TO ANTARCTIC

Three Japanese fleets are whaling in the 23rd Antarctic season, which began Dec. 12,

Japan (Contd.):

1968. Japan has been assigned a national catch quota of 1,493 blue whale units (BWU) for the 1968/69 season. The other two whaling countries, the Soviet Union and Norway, were assigned quotas of 976 and 731 BWUs. Overall catch quota was set at 3,200 BWUs. Because of the depressed whale-oil market, Norway, pioneer in Antarctic whaling, did not send a fleet. ("Suisan Keizai Shimbun," Nov. 22, 1968.)



Cutting up whale aboard a Japanese whaling motherhsip in Antarctic.

日本

Philippines

PLANS TO INCREASE FISH PRODUCTION IN 1969

The Philippine Fisheries Commission estimated that 1,310,000 metric tons of fish were needed in 1968 for nutrition. It also estimated 1968 production would be only 856,000 tons. The 454,000-ton deficit was covered, in part, by an estimated $15 million worth of imported fishery products. The Commission has a 4-year program (1968-72) to increase production.

The Commission has estimated that nutritional requirements for fishery products increase 3% annually, roughly the same rate as population increase, and that annual fish production will increase 6%. If the percentage increases remain the same, the deficit would not be overcome until 1991. The Commission hopes the Philippines will be self-sufficient in fish products by 1972.

FY 1969 Program

The program for Fiscal Year 1969 (FY 1969) seeks to increase production by 115,000 metric tons from these sources:

Commercial fishing	47% - 54,000 metric tons
Municipal fishing	22% - 25,000 " "
Brackish water fishing	17% - 20,000 " "
Freshwater fishing	14% - 16,000 " "

Commercial fishing is the catch from vessels over 3 tons. Municipal fishing, from coastal waters, is catch used for sustenance rather than commerce.

Increased yield of fish per hectare and catch per vessel will be emphasized in FY 1969 because this approach will provide quicker results. Only limited efforts will be made to increase fish-pond area or the number of vessels. A major program to stock inland waters with fingerlings, mostly bangos and carp, should increase fish harvest 7,500 tons from freshwater ponds, and 8,500 from inland waters.

To Train Technicians

The Commission also plans to train 541 technicians to provide technical assistance for 1,000 commercial fishing vessels (about 33% of those in greater Manila area), build fish preservation and processing establishments, develop 17,000 hectares of fish ponds, and aid fishing villages.

Other projects planned for FY 1969 are more ice plants, cold-storage facilities, and a fish market and fishermen's port for the greater Manila area. The Commission also intends to improve research, fishery administration, and fishery-law enforcement.

* * *

TUNA LONG-LINER IN ATLANTIC

The tuna long-liner 'Dianne,' 240 gross tons, is fishing albacore tuna off the Azores under a cooperative agreement with a Puerto Rican packer. The vessel, based at Sao Vicente, Cape Verde Islands, was averaging 3.5-4 tons a set. ("Shin Suisan Shimbun," Nov. 18, 1968.)

Singapore

THE FISHING INDUSTRY

Singapore was a fishing village when Sir Stamford Raffles acquired it for the East India Company in 1819. Under British rule, it turned quickly to other pursuits and has never been the fishing center that its geographical location might suggest. Even today, as the present government boosts fish processing as a means to cut food imports and to earn export dollars, coastal fisheries are increasingly threatened. The rapid industrialization of land-short Singapore is destroying fish and shrimp ponds, and driving marine life from traditional fishing grounds. In the years ahead, catch from local waters will be severely affected by additional oil refineries, and other industries, at newly filled coastal sites.

Commercial Landings

The majority of landings are made by foreign vessels. Over half the landed fish are from West Malaysian waters; fishing in Indonesian waters is still risky for Singaporean and Malaysian boats. The gradually increasing number of Singapore boats reflects government pressure to put locally owned craft under the national flag. Construction of new units for the fleet is insignificant in relation to the total in operation.

Catch Utilization

Nearly all the commercial catch, retailing fresh or frozen, is consumed locally. One plant, employing 300 workers, includes such Chinese-type products as shark's fin soup and sauced shrimp in a wide range of canned products for export. Otherwise, fish processing is minor, although a shrimp-freezing operation began in early 1968. The commercial catch landed supplies less than a fifth of all fish eaten. No statistical record of catch by species, or processing by product type, is maintained except in very general terms.

Consumption

Annual per-capita fish consumption is high, just over 60 pounds in 1967, about 5 pounds above the 1960-65 average. Besides providing protein to a rice-eating population, fish is acceptable to the various diets of Singapore's multireligious society; it is consumed in many forms alien to non-Asian tastes. Tuna, however, is not popular, although local waters contain several species.

Foreign Trade

In 1967, fish made up 5.6% of the value of all food and live-animal imports. Malaysia was the chief supplier, except for the more exotic items--sea slugs, shark's fins, etc. These are valued as much for their supposedly therapeutic effect as for their taste appeal and, traditionally, come from Mainland China and the Middle East. Imports of U.S. fishery products were practically nil in 1967; exports to the U.S. were limited to shellfish worth US$90,000.

Vessels and Gear

Conversion to powered vessels, mainly the purchase of outboard motors by coastal fishermen, has accelerated slightly in recent years. Construction of modern, long-range units is limited. Coastal fishermen in Singapore, Malaysia, and Indonesia object to trolling as they do to drive-in-net fishing, a Japanese technique. The larger vessels long-line for pelagic fishes, profiting from the Singapore consumer's varied tastes, which include barracuda, horse mackerel, and shark.

Employment

Although the latest census showed fishery employment had dropped to 3,700 in 1965, it did not include fish-pond operators fishing carp and other freshwater fish; also, it omitted coastal fishermen using long-lines with fewer than three hooks. It is estimated, therefore, that 4,000 to 4,200 persons regularly gain their living from fishing and fish processing. Fishing enjoys little prestige among the Chinese. The number of Chinese fishermen probably will continue to decrease but there may be some increase in the processing force, mostly female.

Singapore has a research station, but it still lacks a practical training center like the one at Penang in Malaysia. Greater effort will have to be made if Singapore is to have a corps of efficient fishermen able to use modern techniques to harvest the oceans.

India

PLANS TO DEVELOP KERALA STATE FISHERIES

The central government was expected to approve a US$2.6 million fishing development plan for Kerala State. Ice plants, processing plants, and 18 fish harbors are planned. Thirty-one deep sea trawlers, to fish shrimp, tuna, and perch, are to be purchased over a 2-year period. The development is expected to yield 10,000 metric tons for the domestic market, and an unspecified amount for export. ("Seafood Trade Journal," June 1968.)

* * *

DEEP-WATER SHRIMP FOUND OFF KERALA COAST

In early 1968, Indo-Norwegian Project (INP) trawlers discovered a bed of deep-water shrimp in 150 to 200 fathoms off Quilon. Processors and exporters are hoping these grounds will provide commercial quantities.

Women and girls packing shrimp at a deep-freeze plant in Cochin.

From 1958 to 1963, the University of Kerala's Oceanography Department surveyed Kerala's Continental Shelf at 150 stations over an area of 4,800 square miles. Large numbers of Penaeopsis philippi and Penaeopsis rectacutus were collected from stations beyond the 100-fathom line. P. philippi was found occupying an almost continuous bed near the 100-fathom line; the maximum intensity was between Cochin and Calicut. P. rectacutus, less abundant than P. philippi, was found in quantity only in the deeper stations.

The University's collections were predominantly Penaeopsis, while INP catches were mostly Parapandalus and Hetrocarpus.

Need for Future Surveys

Now that INP has found these new commercially exploitable grounds, India should intensify offshore surveys to find the raw materials for an industry that is operating below capacity. ("Seafood Trade Journal.")

Taiwan

PUSHES LARGE FLEET BUILDUP

Taiwan is planning a 5-year fishing fleet expansion program to increase annual production from 458 metric tons to about 800,000 tons in 1972. It hopes to build 155,000 gross tons by 1972 for 5.85 billion yuan (US$146.3 million); 139,000 tons will be for distant-water fisheries. Construction loans will be obtained from the World Bank, domestic banks, the Latin American Fund, Asian Development Bank, and Japan.

A full view of 'Chung Hsin 32,' a steel hull otter trawler of 150-ton class launched in August 1959.

Foreign Firms Profit

To prevent the outflow of profit to foreign firms now handling the transportation of catches, sales, and ship supplies for local vessels, the government will establish the China Marine Trading Public Corp. to handle these services. The agency will start operating as soon as 30 million yuan (US$750,000) is available. ("Shin Suisan Shimbun Sokuho," Nov. 9, 1968.)

Sardine fleet in Agadir, Morocco.

AFRICA

Sudan

MOTHER-OF-PEARL INDUSTRY GROWS

An industry initiated with United Nations help has given some Sudanese an alternative to fishing as a source of income. The Mohamed Qol camp in the Donganab Bay area is the center of a mother-of-pearl industry. The camp's inhabitants, the coastal Hadendowa people, used to depend exclusively on fishing for a livelihood.

Supplies Button Factory

The mother-of-pearl shells are the main source of raw material for a button factory at Port Sudan, 100 miles south.

Fig. 1 - Divers in Donganat Bay show mother-of-pearl shells. The 2 shells commercially valuable are the Trochus and Mother-of-Pearl used primarily in manufacturing buttons. With UN help, Sudan is trying to introduce better methods of collecting shells and stricter grading.

Fig. 2 - a&b - At Mohamed Qol camp, a fisherman cleans mother-of-pearl shells he has just brought ashore from the cultivation beds in the Red Sea. With a companion, he builds a mound behind him.

Sudan (Contd.):

Fig. 3 - Sorting shells at button factory. (UN photos)

INDEX

FIRST NIGHTERS ACCLAIM SEAFOOD STARS

Bravo! Encore! You'll get an ovation, and your guests will demand curtain calls when you feature two star performers from the Pacific Northwest in your dinner productions. King crab and halibut are the featured players in recipes designed to please the gourment tastes of the world traveler, yet simple enough to become family favorites.

Although your guests may be as critical as first nighters, they will applaud when Curtain-Call Crab appears on the menu. Crab meat, one of America's choicest seafoods, is always a talented performer and excels in this production. High in valuable protein, vitamins and minerals, crab meat is always in demand when good eating is on the program. The crab meat is supported in an easy-to-do casserole by a colorful cast of hard-cooked eggs, bread crumbs, a wisp of onion, a tang of lemon, a touch of pimiento, and a custard mixture, then baked until firm with a butter crumb topping. Be ready for repeat performances when Curtain-Call Crab is introduced to your audience.

You can set the stage for real down-to-the-sea eating enjoyment with Encore Halibut as the star! Halibut, the largest actor of the flatfish family, resembles a flying carpet as it ripples through the water. This firm, flavorful fish has a white flesh that is highly prized. In this recipe the halibut is broiled until flaky and then shares the stage with asparagus spears and a topping of cream Cheese Hollandaise Sauce. Encore Halibut is sure to be a long-run hit--try it soon!

The methods for purchasing, handling, storing, and preparing fish are included in the new, 60-page, complete guide to fish cookery, "Let's Cook Fish." This valuable, full-color reference and recipe book is available by sending 60¢ to the Superintendent of Documents, Washington, D. C. 20240.

CURTAIN CALL CRAB

2 packages (6 ounces each) king crab meat or other crab meat, fresh, frozen, or pasteurized
or
2 cans ($6\frac{1}{2}$ or $7\frac{1}{2}$ ounces each)

1 cup soft bread crumbs
1 cup milk
2 tablespoons butter or margarine
1 tablespoon finely chopped onion
1 egg, well-beaten

1 teaspoon lemon juice
$\frac{1}{2}$ teaspoon salt
Dash pepper
2 hard-cooked eggs, chopped
1 tablespoon chopped pimiento
$\frac{1}{2}$ cup soft bread crumbs

2 tablespoons melted butter or margarine

Thaw frozen crab meat. Drain crab meat. Remove any remaining shell or cartilage. Cut crab meat into 1 inch pieces. Combine crumbs, milk, butter, and onion. Bring to a boil. Combine egg, lemon juice, salt, and pepper. Gradually stir hot milk mixture into egg mixture. Stir in chopped egg, pimiento, and crab meat. Pour into a well greased quart casserole. Combine crumbs and butter. Sprinkle over top of casserole. Bake in a moderate over, 350° F., for 40 to 45 minutes or until firm in the center. Makes 6 servings.

ENCORE HALIBUT

2 pounds halibut steaks or other fish steaks, fresh or frozen
$\frac{1}{4}$ cup butter or margarine, melted
1 teaspoon salt
Dash pepper

1 package (10 ounces) frozen asparagus spears
Cheese Hollandaise Sauce
Paprika

Thaw frozen steaks. Divide into 6 portions. Place fish on a well-greased baking pan, 15 x 10 x 1 inches. Combine butter and seasonings. Pour over fish. Broil about 4 inches from source of heat for 10 to 15 minutes or until fish flakes easily when tested with a fork. Baste once during broiling with butter in pan. While fish is broiling, cook asparagus according to directions on package. Place fish on a warm serving platter. Arrange asparagus spears on fish. Top each serving with Cheese Hollandaise Sauce. Sprinkle with paprika. Makes 6 servings.

Cheese Hollandaise Sauce

1 package (8 ounces) cream cheese, softened
2 eggs

$2\frac{1}{2}$ tablespoons lemon juice
Dash salt

Cream the cheese until light and fluffy. Add eggs, one at a time, beating thoroughly after each addition. Stir in lemon juice and salt. Cook in top of a double boiler over hot water until thick and fluffy, stirring constantly. Serve warm. Makes $1\frac{1}{2}$ cups sauce.

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

Serving Meals in Quantity

One purpose of BCF's Branch of Marketing is to provide educational materials and services to schools, restaurants, military establishments, cafeterias, and other organizations that serve meals in quantity. Through information on quality maintenance, preparation methods, menu planning, product availability and variety--this effort expands the utilization of fishery products in mass-feeding outlets.

COMMERCIAL FISHERIES Review

VOL. 31, NO. 2

FEBRUARY 1969

COVER: Japanese fisherman holds typical wicker and grass basket containing a single set or skate of coiled longline gear. Number of hooks in basket varies from 20 to 50. See article p. 26. (Photo: Branson)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

The Bureau of Commercial Fisheries and The Bureau of Sport Fisheries and Wildlife make up The Fish and Wildlife Service of The United States Department of the Interior.

Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

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IV

BROAD U.S. EFFORT URGED TO UNDERSTAND, USE AND PRESERVE OCEANS

"We believe that a vigorous, systematic investment in the oceans will yield a tremendous return over the years ahead--a tangible return to the economy and an intangible return of priceless value, the quality of the environment in which we live."

The speaker was Dr. Julius A. Stratton, Chairman of the Commission on Marine Science, Engineering and Resources, at a press conference held Jan. 11, 1969, before public release of the Commission's final report to the President and Congress. Dr. Stratton is chairman of the Ford Foundation and former head of M.I.T.

After nearly 2 years of study, the 15-member Commission urged a large U.S. investment in ocean research to understand, use, and protect the oceans. The Commission members included experts from U.S. and State governments, universities, industry, and marine laboratories.

The Commission studied a vast range of marine problems--from preserving coastal shores and estuaries to "more effective use of the vast resources that lie within and below the sea." Its members consulted with more than 1,000 people: marine scientists, engineers, leaders of business and industry, academic community, and many marine specialists in U.S., State, and local governments.

The Commission recommended creation of a new U.S. agency for the oceans and the atmosphere: The National Oceanic and Atmospheric Agency (NOAA). Initially, NOAA would be composed of the U.S. Coast Guard, the Environmental Science Services Administration, the Bureau of Commercial Fisheries (plus the marine and anadromous fisheries functions of the Bureau of Sport Fisheries and Wildlife), the National Sea Grant Program, the U.S. Lake Survey, and the National Oceanographic Data Center.

The Commission did not urge a crash program--"but one geared realistically to the means of the Nation." The 1969 budgets for the agencies and programs that would be transferred immediately to NOAA--if President Nixon and the 91st Congress approve--total $773 million. The Commission projects for 1980 a $2 billion annual operating budget for NOAA.

BIRTH OF COMMISSION

Creation of the Commission was authorized by Public Law 89-454, enacted by Congress on June 17, 1966. President Johnson appointed the members on Jan. 9, 1967. The Act also set up the National Council on Marine Resources and Engineering Development.

The Council chairman is the Vice President. The Council is made up of the heads of major Federal departments and agencies with marine missions. It plans and coordinates the existing marine programs and advises the President. It surveys the state of marine affairs and shapes and strengthens Federal programs.

The Commission was not given operating responsibility. In its Report, the Commission recommended that the Council, scheduled to expire June 30, 1969, continue until NOAA is established.

The Act expressed the conviction that the U.S. ought to give serious attention to its marine environment--and to the seas' potential resources. It also showed, the Commission Report noted, U.S. determination to act in order to "stimulate marine exploration, science, technology, and financial investment on a vastly augmented scale."

The Commission was asked to study the U.S. stake in the "development, utilization, and preservation of our marine environment. . .to review all current and contemplated marine activities and to assess their adequacy to achieve the national goals set forth in the Act. . . ." And the Commission was asked "to formulate a comprehensive, long-term, national program for marine affairs designed to meet present and future national needs in the most effective possible manner. . .and to recommend a plan of government organization best adapted to the support of the program and to indicate the expected costs."

To carry out its mission, the Commission divided itself into 7 panels: basic science; marine engineering & technology; marine resources; environmental monitoring and the management of the coastal zone; industry and private investment; international issues; and education, manpower, and training.

U.S. AND THE SEA

The Report states: "How fully and wisely the United States uses the sea in the decades ahead will affect profoundly its security, its economy, its ability to meet increasing demands for foods and raw materials, its position and influence in the world community, the quality of the environment in which its people live."

By 2000, the U.S. will have 350 million people and will rely more on food from the sea. New jobs will be needed and the expanded ocean industries will offer opportunity for economic growth. Today's industrial operations in the sea show the potential for greater economic operations: offshore petroleum, gas, and sulphur recovery; mining of tin, diamonds, sand, gravels, and shells from the seabed.

Along with economic development must go other considerations. The oceans are one part of the whole physical environment--and much more must be known about it. "It is critical to protect man from the vicissitudes of the environment and the environment, in turn, from the works of man." Today, the chance of quick economic gain makes man ignore the environment.

If the sea and shoreline are protected, they can provide recreational opportunities for the growing U.S. population. But, the Report warns, "the pollution problem pervades all aspects of our expanding technological society."

"The oceans and marine-related activities must be viewed in the context of the total land-air-sea environment. In many ways, the oceans are the dominant factors in this total environment." Man's intervention in any one element affects the others. "The Nation's stake in the oceans is therefore an important part of its stake in the very future of man's world."

A PLAN FOR NATIONAL ACTION

A solid base of science and technology is "the common denominator" to accomplishment in the marine world, the Report emphasizes. It makes clear what is needed to advance U.S. technical capability in order to realize fully the sea's potential:

• Marine Science: It is vital to support basic marine research if the U.S. is to "understand the global oceans, to predict the behavior of the marine environment, to exploit the sea's resources, and to assure the national security."

Today, the U.S. "is poorly organized to marshal the arrays of multiple ships, buoys, submersibles, special platforms, and aircraft, as well as the complex undersea facilities required for important oceanic investigations and experiments of a basic character."

The Commission proposes that several leading institutions in ocean research be designated by the U.S. "University-National Laboratories" and be "equipped to undertake major marine science tasks of a global or regional nature." Their establishment should not prevent other marine science research in other schools from getting help.

• Marine Technology: The Commission urges that NOAA begin a program to encourage development of basic marine technology and engineering to expand undersea operations and to lower their costs. It proposes that 2 U.S. goals be pursued at same time:

--Development of technology to carry out production work "for sustained periods" down to 2,000 feet.

--Development of technical capability to go down for useful purposes to 20,000 feet. (This takes in about 98% of world's ocean floor.)

• Scientific & Technical Information: A successful national ocean effort needs improved communications throughout the marine community.

• Manpower for a Marine Effort: NOAA should help to "develop and maintain manpower inventories, statistics, trends, and projections."

• Support Capability for Marine Operations: Marine operations depend on services provided primarily by the Federal Government. These services include: "mapping and charting, aids to navigation, maintenance of waterways, salvage, safety, law enforcement, and certification of some types of personnel and equipment." Some of these are satisfactory, others need upgrading, and virtually

all "will be inadequate to satisfy the demands of an expanded national effort."

• Exploring, Monitoring, Predicting, & Modifying Environment:

The Commission says the U.S. "must have a comprehensive system for monitoring and predicting the state of the oceans and the atmosphere. The U.S. has the beginnings of such a system today. . . ." Because increasing technological capabilities give man the power "to intervene in natural environmental processes for beneficial ends," the Commission believes that the problems of modifying the environment cannot be separated from those of monitoring and predicting the environment. It recommends "a concerted effort by NOAA to explore the feasibility and consequences of environmental modification."

• Exploring the Deep Sea: "Present instruments to observe and measure in the depths are entirely inadequate. Except for occasional samples of the bottom and the living organisms of the abyss, little is known about the deep ocean." Instrumentation must be improved drastically, especially that for surveying marine resources accurately.

But instruments alone are not enough. Man must be able to go to the depths for extended periods. The U.S. should start "to develop deep submersibles with ocean transit capabilities for use as research and exploration platforms at depths to 20,000 feet under the sea, and to study the feasibility of manned deep ocean stations."

• Environmental Modification: The U.S. must develop the skills and equipment to assess "the global consequences of man's activities, such as the burning of fossil fuels, the use of pesticides and insecticides and the effects of particulate and gaseous pollutants."

A PLAN FOR COASTAL ZONE

• Managing the Coastal Zone: 30 States border sea coasts and the Great Lakes. They are principally responsible for determining whether actions "on or near our shores are beneficial or damaging." Effective State action often is very difficult because of conflicting and overlapping U.S., State, and local laws concerning coastal-zone activities. There is little coordination.

The Commission recommends that primary responsibility for managing the coastal zone remain with the States--but that Federal legislation be enacted "to encourage and support the creation of State Coastal Zone Authorities to carry out specified national objectives with regard to the zone. The Authorities should have clear powers to plan and regulate land and water uses and to acquire and develop land in the coastal zone." The legislation should give NOAA primary responsibility for working with the States.

• Science & Technology in Coastal Zone: More scientific knowledge is needed about natural coastal-zone processes on which to base important management decisions.

The Commission recommends "designation and support of university-affiliated Coastal

Zone Laboratories to work on regional and local problems." These labs will perform services like those of agricultural research stations and extension services. They should be developed and supported by NOAA.

In addition to the labs, representative coastal and estuarine sites should be set up "as natural preserves." There, necessary studies should be conducted "to establish a proper base from which the effects of man's activities can be determined and ultimately predicted."

• Attacking Coastal Zone Pollution Problems: Coastal waters have been polluted by wastes dumped into the rivers, the filling of marshlands, and the spreading of spoil from dredging. Research into these pollution problems must be speeded, and methods devised to handle waste collection and treatment. U.S. labs, universities, and industry must concentrate on this purpose. The work should begin "far upstream."

• Great Lakes Restoration: To reverse the deterioration of the Great Lakes under man's assault for a century is an "urgent national need." Restoration may be possible. The Commission proposes a "National Project" to speed the necessary scientific research and technological development.

• Interim Policies: The plans for the estuaries and coastal zones will take time. Meanwhile, existing U.S. and State laws on water quality must be enforced strictly. States must move very slowly before approving operations that may alter the coastal zone until more information about the effects of these operations are known--and until State plans can be developed.

Developing Resources of Sea

There are many resources beyond the shoreline already contributing much to the U.S. economy. There is need for an "institutional framework and the scientific and technological foundation" to assure that the U.S. can get these resources when she needs them.

Commercial exploitation of these resources is the domain of profit-oriented industry. The U.S. plan should make it possible for industry to operate effectively with U.S. help when it is needed.

Drugs from the Sea

Both marine plants and animals have active substances that are potential drug sources to treat humans. The Commission recommends establishment of a new Institute of Marine Medicine and Pharmacology in the Department of Health, Education, and Welfare to evaluate these substances. The Institute should establish the basic information the pharmaceutical industry needs.

World fisheries remain the sea's largest economic harvest--despite the large amount of oil taken and the growing production of other marine minerals. The annual value of the world catch of fish and shellfish, estimated at $10 billion in 1968, is nearly one and a

third that of all other resources. During the past decades, it has increased over 6% a year.

While world fishing has increased, the relative position of the U.S. has dropped. During the past 30 years, the U.S. catch has remained "almost constant." Although she accounts for only 4% of world catch, the U.S. consumes about 12% of the total and is the world's largest market.

Foreign nations catch more fish on traditional U.S. fishing grounds than U.S. fishermen. The latter harvest less than 10% of the useful and available species adjacent to the coasts. Except for such fisheries as tuna and shrimp, the U.S. fleet is technically outmoded. U.S. fishermen are unemployed more and earn lower incomes than other workers of comparable age and skill.

While there is "no compelling reason" for U.S. fishermen to catch all fish consumed here, major parts of the U.S. fishing industry "can be restored to a competitive, profitable position with consequent benefit to the economy." Modern U.S. vessels on the world's fishing grounds would strengthen U.S. ability to negotiate a "productive and equitable system to regulate international fisheries."

The Commission proposes a "multiple attack" on fishery problems "with scientific research to improve understanding of the resources, exploration to determine quantities and locations, technology to develop efficient methods of harvesting and processing, and an improved framework (principles, procedures, and institutions)." These should enable U.S. fisheries to compete without subsidy or protection.

Framework for Fishery Development

To rehabilitate the fisheries, the U.S. "must eliminate the overlapping, conflicting, restrictive Federal, State and local laws which have hampered even those fisheries with sufficient capital and technological skill to be truly competitive." Protectionism and parochial state laws "have impeded the development and use of modern fishing technology. Federal support programs have not served their purpose."

Fishery laws and regulations should be studied and restructured. A new framework should be created based on U.S. objectives for fishery development and the best information. The interests of sport fishermen should be considered.

The Commission proposes that State responsibility for managing fish stocks in coastal zone waters continue--but that NOAA take jurisdiction over endangered fisheries if the States fail to take conservation measures. To rehabilitate the U.S. fisheries, the requirement that fishermen buy only U.S.-produced vessels and gear should be ended. Fishermen should be allowed to buy better gear, boats, and at lower prices anywhere.

Research, Technology, & Survey Programs

We have inadequate knowledge of the availability and distribution of marine species; optimum annual harvest consistent with

conserving valuable species; life cycle and ecological relationships among species; how estuarine-dependent species are affected by man's changes. Yet about 70 of such species make up about two-thirds of U.S. catch.

The Commission recommends that NOAA begin to get this information. It should seek, particularly, underutilized fisheries off U.S. "Once located and sustainable yield determined, the fish should be caught with maximum efficiency, carried to market in the best condition, and ultimately retailed or processed." New technology is needed to improve these operations. To increase fish consumption, "new fish stocks, new processes, and new markets must be created. The Commission recommends that NOAA develop its technology program to accomplish these ends."

Aquacultural Research and Development

Aquatic culture of some species can contribute much to the economy and to the war on hunger. The harvestable surplus of natural stocks is limited. But harvests of cultured species are limited only by the acreage used, and by economic competition with other marine stocks.

Sea plants have industrial value, "but many promising commercial uses are still limited by the availability of seaweed supplies." Evidence shows some useful seaweeds can be cultured. "Although research is rapidly demonstrating the feasibility of aquaculture, full-scale commercial application is limited by legal, organizational, political, and technical constraints." As these are removed, aquaculture "should become a powerful new global resource."

The Commission recommends that NOAA be responsible for advancing aquaculture.

HOW TO HELP INDUSTRY

The Commission recommends these approaches to aid the U.S. fishing industry:

- "The U.S. should continue its own research programs aimed at improving stock and yield estimates, cooperate with other nations in programs for this purpose, and explore new techniques for preliminary assessment of stock size and potential yield where new fisheries are contemplated."

- Fisheries management should have as a major objective "production of the largest net economic return consistent with the biological capabilities of the exploited stocks."

- Voluntary steps should be taken--and, if necessary, governmental action--to reduce excess fishing effort. This would make it possible for fishermen "to improve their net economic return and thereby to rehabilitate the harvesting segment of the U.S. fishing industry."

- "The goal of domestic fisheries management must be the development of a technically advanced and economically efficient fishing fleet with the minimum number of units required to take the catch over a prolonged period of time. This goal must be achieved in fisheries which are now heavily

over-capitalized without seriously dislocating those fishermen who entered the industry in good faith."

The international law of fisheries prevents the U.S. from acting alone to "maximize the net economic returns" of U.S. vessels fishing on international grounds. If the U.S. tried to limit its fleet in these fisheries, other nations could increase theirs--and so prevent the U.S. from raising its share per unit of effort.

Where U.S. fishermen alone are permitted to fish, U.S. or State action can control the amount of fishing. The action should meet local conditions.

Fishermen & Fishing

The Commission Report notes: "Fishing is an ancient business, and its practitioners often are less concerned with economic efficiency than with the simple fact of making a living from the sea. Fishermen may be perfectly aware that a half-dozen modern, efficient ships could harvest the permissible crop with high monetary return, but they still may prefer a system under which a number of fishing families can eke out what, to them, is an adequate living of the kind they prefer. Because such fishing communities form the constituencies of important elements in state legislatures, their desire to maintain the status quo has a strong influence on fishing legislation and on regulations of state agencies."

REHABILITATING THE INDUSTRY

The U.S. fishing record contrasts sharply with the record growth of world high-seas fisheries. During the past 30 years, U.S. landings have remained about the same, and the U.S. position among the world's fishing nations has fallen from second to sixth. U.S. vessels land about one-third of the fish eaten in the U.S.

There are a few bright spots on the record--most notably, the tuna and shrimp fisheries. And, overall, the U.S. catch is third or fourth in the world when measured in dollar value. But the U.S. fishing fleet is outmoded technically. It cannot carry out high-seas operations needed to maintain a world-leadership position--and it cannot attract "a stable and efficient labor supply."

Demand for Seafood Strong

This fishing industry decline has occurred despite the strong demand for fish and shellfish products. Per-capita human consumption has remained about the same during the past 30 years, but population growth has expanded the market. U.S. agriculture has reduced the cost of livestock feeds by using fish meal as an ingredient. So total U.S. per-capita consumption has increased sharply since 1950--but the increase has been met by imports, not by increased U.S. production.

The Commission says that the U.S. does not have to be completely self-sufficient in

fishery products any more than in other products. The total welfare of the fishing industry, including processing and marketing, "dictate the desirability" of buying marine products from the cheapest and best sources. The two healthiest fisheries, tuna and shrimp, are among the largest importers--yet have increased demand for U.S. production.

The Commission believes that important industry segments can be restored to "competitive, profitable operation." But it will be necessary to overcome obstacles to efficient operation even where U.S. technology and capital should have given the fleet a competitive advantage.

Federal & State Management Roles

There are too many restrictive and overlapping laws and regulations concerning U.S. fishing. The States have most jurisdiction over management and development; the lines between the States and U.S. are poorly defined. Too much protective legislation "militates against research, development, and innovation. Consequently, the fishing industry has been slow even to borrow useful techniques from other industries, much less to pursue a progressive program of its own."

The U.S. has "no explicit role" in managing fisheries within U.S. territorial waters. Because there is a "discouraging lack of coordination among State programs," the Commission concludes that U.S. leadership and, when necessary, regulatory power, "must be asserted."

The Commission recommends: "The National Oceanic and Atmospheric Agency [BCF in this operation] establish national priorities and policies for the development and utilization of migratory marine species for commercial and recreational purposes in cooperation with other Federal agencies, States, and interstate agencies."

Further, says the Commission: "NOAA (BCF) should encourage interstate cooperation for regulation and conservation, sponsor research on the impact of institutional barriers inhibiting the efficient development of our commercial fisheries, and encourage enactment of improved state laws relating to the regulation and conservation of such fisheries. The Federal Government also should reorient its fisheries research and survey activities in support of specific fisheries missions."

But even more is needed, the Commission states. It recommends that NOAA (BCF) "be given statutory authority to assume regulatory jurisdiction of endangered fisheries when it can be demonstrated that:

- "A particular stock of marine or anadromous fish migrates between the waters of one State and those of another, or between territorial waters and the contiguous zone or high seas; and

- "The catch enters into interstate or international commerce, and

- "Sound biological evidence demonstrates that the stock has been significantly reduced or endangered by act of man, and

• "The State or States within whose waters these conditions exist have not taken effective remedial action."

Vessel Subsidy Program

The U.S. fishing fleet is the world's second largest, but 60% of it is over 16 years old and 27% over 26 years. The tuna, shrimp, and Alaska king crab fleets are fairly modern, but fishing technology progress has made most of U.S. fleet obsolete.

The cost of building fishing vessels in some foreign shipyards is 40 to 50 percent lower than in U.S. shipyards. Yet U.S. laws prohibit fishermen from buying foreign-built vessels for use in domestic fisheries. To help correct this inequity, Congress passed in 1964 the United States Fishing Fleet Improvement Act (P.L. 88-498).

Under this program, the Interior Secretary can pay up to 50% of construction cost of new fishing vessel if vessel, the owner, and the fishery meet certain requirements.

The Commission recommends enactment of legislation "to remove the present legal restrictions on the use of foreign-built vessels by U.S. fishermen in the U.S. domestic fisheries."

Research and Technical Programs

NOAA (BCF) should concentrate its efforts where the greatest opportunities exist for successful economic expansion. These areas and species "might include Mid-Pacific tuna, demersal, and other fish and shellfish resources in the Gulf of Alaska, anchovy off the southern California coast, clupeids in the Gulf of Mexico, alewives (and their predators) in the Great Lakes, and Pacific hake."

The development of these high-potential fisheries can be aided by:

• "Surveys and exploratory fishing programs to establish the potential of latent stocks;

• "Basic biological studies to provide a basis for yield assessment;

• "Development of new harvesting techniques and strategies;

• "Development of more efficient methods for processing and handling fish products, including quality control and increasingly diversified product utilization."

The Commission recommends that NOAA (BCF) "analyze each major fishery and develop integrated programs designed to exploit those fisheries where opportunities for expansion exist."

Not enough is known about the stocks available off the U.S. and about the factors determining their yield, particularly for low-valued species. To develop new fisheries, it is necessary to determine the amount of the resources that fishermen can "reasonably expect to harvest profitably." The U.S. Government must support this expanded survey program because no single sector of the industry can afford it. The program also would obtain the basic information to manage the

resources rationally. "Only by delineating resource potentials can overfishing be detected before the damage is done and new fishing grounds be identified to relieve the pressures on the old," the Report states.

The Commission has endorsed a BCF proposal that gives priority to those species and areas where U.S. vessels might have strong competitive advantage. By adding 11 chartered vessels to its fleet, BCF would be able to map completely the groundfish and shellfish resources of the U.S. continental shelf--and complete preliminary work on pelagic and midwater fisheries--within 10 years.

The Commission recommends that NOAA (BCF):

- "Develop rapid means for stock assessment;

- "Conduct surveys and exploratory fishing programs to identify and establish the dimensions of latent fisheries off the U.S. coast;

- "Continue to support basic studies relating to fish habitats, population dynamics, and the effects of environmental conditions;

- "Give priority attention to development of improved statistical data and analytic techniques."

Technical Programs

The expense in U.S. fisheries can be reduced by improving conventional gear and using equipment developed abroad. The Commission recommends that NOAA (BCF) set up "an expanded program to develop fishing technology by improving the efficiency of conventional gear and developing new concepts of search, detection, harvesting, transporting, and processing."

Extension Services

The Commission recommends that "fisheries extension services, analogous to the Agricultural Extension Service, be established in order to facilitate transfer of technically useful information to fishermen at the local level."

Fish Protein Concentrate

The Commission recommends "expanded support for the BCF program to develop fish protein concentrate technology." (See CFR, Jan. 1969, on U.S. FPC Program.)

INTERNATIONAL FISHERY MANAGEMENT

The Commission concludes that the existing framework of international fisheries management "is seriously deficient." But it is not time to recommend "a single framework for the management of all the uses of the oceans." The Commission recommends that the U.S. propose:

"New international frameworks (principles, rules, procedures, and institutions) for the exploration and exploitation of the numerous resources underlying the high seas and the conduct of scientific inquiry in the oceans.

"Improvement and extension of the existing network of international fisheries agreements."

Specifically, the Commission recommends that the U.S. seek agreement in the International Convention for the Northwest Atlantic Fisheries (ICNAF, 14 nations, including U.S.) to collaborate with the Northeast Atlantic Fisheries Convention (NEAFC, 13 nations, but not U.S.) to fix a single, annual, overall catch limit for cod and haddock of the North Atlantic. This would include the whole ICNAF area and Region 1 of NEAFC area (East Greenland, Iceland, Northeast Arctic).

"This single annual overall catch limit," the Commission recommends, "should be designed to maintain the maximum sustainable yield of the fishery and, in turn, should be divided into annual national catch quotas. The overall catch limit should be adjusted regularly to take account of such factors as year-class fluctuations of the stocks, recovery of the stocks due to conservation measures, and errors in setting prior limits. Every participating nations should be authorized to transfer all or part of its quota to any other nation."

Further, the Commission recommends that the U.S. "take advantage of the opportunity presented by a quota system to rationalize its fishing effort in the North Atlantic."

And the Commission recommends that "early consideration be given to instituting national catch quotas for the high seas fisheries of the North Pacific."

The Report also contains these Commission recommendations on international fisheries:

- Coastal nations should have preferential access to marine resources off their coasts to reduce international tensions and the seizure of vessels. "It is not easy, however, to apply this principle in particular cases."

- Attempts should be made to agree on the maximum breadth of the territorial sea.

- International fishery organizations should be strengthened with more funds and staffs.

- Diplomatic efforts should be renewed to persuade all fishing nations to adhere to the Convention on Fishing and Conservation of the Living Resources of the High Seas.

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UNITED STATES

U.S. Fishermen Get Protection Against Losses from Vessel Seizure

The Fishermen's Protective Act has been amended to cover losses sustained by owners of U.S. vessels seized by foreign countries on the basis of rights or claims in territorial waters or the high seas which are not recognized by the U.S. The Secretary of the Treasury, through the Secretary of State, will reimburse owners for fines, license or registration fees, or any other direct charges paid to secure release of the vessel and crew.

Protection Against Loss or Damage

Protection against other losses incurred as a result of seizure and detention will be provided through a Fishermen's Protective Fund, to be administered by BCF. These losses include damage to, or loss of, the vessel, its fishing gear or other equipment, and charges for dockage fees and utilities. Payment may also be claimed for the market value of fish or shellfish caught before seizure and confiscated or spoiled during detention, and for 50% of the gross income lost to owner and crew as a direct result of the seizure.

Eligibility and Fees

Any owner of a commercial fishing vessel documented or certified in the U.S. is eligible to apply for protection under this Fund by submitting an application form, and a fee of $60 plus $1.80 per gross ton. The fees will cover the administrative costs and one-third of claim estimated to be paid from the Fund.

Application forms and further information may be obtained from BCF's regional offices or from Bureau of Commercial Fisheries, Division of Financial Assistance, 1801 N. Moore St., Arlington, Va. 22209.

BCF Increases Calico Scallop Investigation

The Bureau of Commercial Fisheries is intensifying its investigation of the abundant, potentially important, calico scallop resource discovered off northern Florida in 1960 by Bureau scientists. BCF's Tropical Atlantic Biological Laboratory (TABL) of Miami, Fla., has joined in the work that has been conducted for 8 years by BCF's Pascagoula (Miss.) and St. Simon's Island (Ga.) exploratory fishing bases.

The scallop beds lie off Cape Kennedy and extend more than 200 miles, roughly from St. Augustine to south of Stuart, generally between 15 and 30 fathoms. BCF scientists hope for an annual production, in 5 years, of 15 million pounds worth an estimated $20 million. In the U.S., calico scallops (Aequipecten gibbus) apparently are confined to the southeastern coast and the Gulf of Mexico.

The Lab's Project

TABL's marine scientists assigned to the new program will seek biological understanding of the life history of the bottom-dwelling mollusc. As the fishery develops, information will be needed about "growth and reproduction rates, stock sizes, longevity, diseases to which the scallop may fall prey, and the marine environment in which the animal lives." Laboratory research will include attempts to rear the species artificially. The goal of TABL's biological studies will be to provide information and advice to the commercial industry that will help maintain a good supply of calico scallops and, when an intensive fishery has been activated, to protect it from overexploitation. Other BCF units will continue to work on exploratory fishing and gear research, technology, marketing, and statistics.

New Shucker Available

One problem that has slowed the development of a calico scallop fishery has been the lack of a mechanism that can efficiently shuck the relatively small shellfish. (A 75-pound bushel of live scallops yields only $3\frac{1}{2}$ to $6\frac{1}{2}$ pints of edible meats.) An automatic shucker

has been devised which could have a revolutionary effect on the beginning fishery. The combination shucker-eviscerator-cleaner can be installed aboard ship for rapid processing of scallop meat. Its inventor claims the apparatus can prepare scallops for the market--from shell to frozen meat--at the rate of 8 pounds of meat a minute. Also, at least 6 new factory-style vessels are nearly ready to enter the fishery; others are expected to be built or converted soon.

Related to Gourmet Scallop

The calico scallop is closely related, scientifically and dietetically, to the bay scallop, a seafood delicacy. The few people who have tasted the calico scallop claim it is as delicious as the somewhat-smaller bay scallop. The difference in meat size is due to an unusually large adductor muscle, the edible part of a scallop, which holds the 2 shell halves together. Calico scallops are called that because of their shells' mottled appearance.

Encouraging Fishing Results

Catches of calico scallops have been very small because of the lack of proper equipment and data concerning exact locations of commercial quantities. But some BCF findings may be a stimulant to commercial fishermen: During simulated commercial fishing from BCF's 'Silver Bay,' catches in 30-minute periods often amounted to more than 1,500 pounds; one reached 2,200 pounds. On a 6-day fishing cruise by BCF's 'Oregon,' the average catch was 1,600 pounds per hour. Once, the Oregon caught 5,800 pounds of scallops in an hour; at current retail prices, the catch would be worth more than $800.

Industrial Fish Will Be Sought Off Midatlantic Coast

BCF has made a 1-year, $95,000, research grant to the Virginia Institute of Marine Science (VIMS) to discover and test underutilized fish off the Midatlantic coast. Exploratory fishing operations were slated to begin in February 1969.

VIMS has chartered an industry vessel, the 'W. T. James, Jr.,' to locate winter supplies of marine herring. Initial fish scouting will be conducted between Cape Henry, Va., and Cape May, N.J., and off Long Island. Results will be relayed to the fishing industry as they are obtained.

1968 New England Food Fish Landings Declined

Preliminary data show that food fish landings for 1968 at principal New England ports totaled 344 million pounds; in 1967, the figure was 355 million. In 1968, New Bedford, Mass., led with 90 million, Gloucester had 75, and Boston was in third place with 60 million.

In 1968, industrial fish landings at those ports were up substantially--105 million pounds; in 1967, 97 million. The leader in 1968 was Point Judith, 44 million; followed by New Bedford, 36 million; and Gloucester, 23 million. In 1967, such landings at Gloucester were only 8 million pounds.

Cooling Trend in New England Waters May Be Over

The downward trend in sea-water temperatures of the New England fishing banks that began in 1953 may have stopped. This was reported by scientists of BCF's Woods Hole (Mass.) Biological Laboratory. Their analysis of temperature conditions in 1968 showed marked increases over 1967--as much as 1° C. for the annual average of inshore surface temperatures. Comparing September temperatures in 1968 with those in 1965 and 1966, they found inshore temperatures 1° C. higher and offshore temperatures up to 6° C. higher.

An important part of the Woods Hole study indicates that temperature trends are more than surface phenomena. The trends are related to movement of warm slope water onto the Continental Shelf. This thesis is supported by observations made by BCF's 'Albatross IV' and the U.S. Coast Guard's 'Evergreen' in the ICNAF environmental studies.

1968 Lake Erie Commercial Catch Shows Slight Increase

The commercial landings for Lake Erie in 1968 are expected to total over 49 million pounds, a slight increase from the 1967 catch, reports BCF. This increase results from larger catches in the Ohio and Ontario waters.

The 1968 lakewide landings, however, are still about average for the past 50 years. Canadian fishermen harvested more than 77% of the total, up 1% over 1967. Ohio fishermen harvested about 20%; Michigan, Pennsylvania, and New York totaled the remaining 3%. Until 1954, U.S. landings had always provided the majority of the catch. Thereafter, the U.S. catch declined steadily and commercial fishing became primarily a Canadian enterprise.

STATUS OF THE YELLOW PERCH

During 1968, there were excellent landings of yellow perch. The Lake Erie catch comprised over 26 million pounds: Canadian landings over 22 million; U.S. landings, slightly less than 4 million. Ohio's production is expected to total about 3 million pounds, slightly better than 1967. Michigan and Pennsylvania catches are also slightly higher and New York's lower. This continued "high level" of perch production in 1968 is attributed to the large influx of the strong 1965 year-class, which first entered the fishery in significant numbers. Analyses of the scale collections from BCF's sampling program indicate that this year-class, as III-year-old fish, contributed 39% of the total spring production. In the fall fishery, it contributed nearly 75% of the total catch.

The only previous strong year-class produced in the 1960's was hatched in 1962. These fish were responsible for high production from 1965 through 1967, but have now passed out of the fishery.

The 8-inch limit on perch put in effect several years ago continues to have considerable influence on Ohio landings. The sampling program revealed that approximately 39% of the fish in the spring fishery, and 55% in the fall fishery, were below $8\frac{1}{2}$ inches, the previous limit.

The growth rate of the yellow perch is as good or slightly better now than during the early 1960's. Then, yellow perch required a minimum of four complete growing seasons to reach 8 inches. At the end of 1968, the 1965 year-class of perch (completing their fourth year) averaged 8.2 inches; the 1966 year-class, 7.3 inches; the 1967 year-class, 5.9 inches; and the 1968 year-class, 3.7 inches.

The spawning success and survival of young perch has undergone considerable fluctuation during the past decade. Good hatches occurred in 1959, 1962, and 1965, but the hatch in 1966 was the lowest. The 1967 hatch was rated fair, followed by another weak year-class in 1968. The lack of a relative good year-class within the past 3 years is discouraging. These poor hatches, and low survivals from a stock more than adequate to replenish the population, point toward "deteriorating environmental conditions" as the contributing factor.

BCF concludes: "We can expect another good year in 1969, although the landings will undoubtedly be less than in 1968. A marked decline will follow in 1970 and continue until such time as another successful year-class is produced."

STATUS OF THE WALLEYE

Lake Erie walleye landings dropped from 1,258,000 pounds in 1967 to approximately 831,000 pounds in 1968, the third lowest since 1920. Preliminary 1968 figures for states and the Province of Ontario reveal: Ontario landed 311,000 pounds; Ohio, 304,000 pounds; New York, 120,000 pounds; Michigan, approximately 88,000 pounds; and Pennsylvania, about 8,000 pounds. Compared with 1967, the catch in Ohio increased almost 75 percent, while production in New York and Pennsylvania remained about the same. However, Ontario and Michigan both experienced a 58-percent reduction.

BCF's analysis of the 1968 landings in the lake's western basin showed the 1965 year-class, the last remaining strong year-class, constituted over 90% of the U.S. spring catch. However, fall landings revealed that the 1965 year-class accounted for only 32%. This year-class, which entered the commercial fishery during fall 1966, has contributed the following to the Ohio seasonal landings: fall 1966--5,000 fish; spring 1967--44,000; fall 1967--23,000; and spring 1968--127,000 walleyes. In fall 1968, however, the number of 1965 year-class walleyes in the Ohio catch

dropped to about 1,000 fish; this indicated this year-class was fairly well fished out. Other year-classes present in fall landings included the 1966 year-class (15%) and the 1967 year-class (53%). BCF notes: "We do not expect these relatively weak year-classes to contribute to the catch anywhere near the 1965 year-class."

The population in the lake's western basin has been experiencing good year-classes every 3 years (1959, 1962, and 1965). A substantial year-class hatch had been anticipated in spring 1968, but this did not occur. A sufficient number of spawning fish of the 1965 year-class were present, but for unknown causes the spawn did not hatch and survive.

The commercial fishing outlook for walleyes in the near future looks quite disappointing for the western basin. The industry will have to depend upon the weak 1966 and 1967 year-classes. Total lake production will probably drop to an all-time low in 1969 and may not reach 600,000 pounds.

On the other hand, landings in the eastern basin revealed a much healthier population as large mesh gill-net catches were composed of 8 to 10 age groups. A tagging program was conducted during the spring and fall fishing season of 1968. Over 2,500 walleyes of various ages were marked and released in hope that the recovered fish would provide an estimate of the population size, their seasonal movements, and the discreteness of the population.

Oregon Shipped Nearly 14 Million Coho Eggs in 1968

With the shipment of 500,000 coho eggs to Korea at the end of 1968, the Oregon Fish Commission completed a record season of egg-shipping operations. Almost 14 million eggs were sent to more than 20 State and Federal resource agencies throughout the U.S. during November and December. All were surplus to the Commission's needs.

The shipment to Korea was one of the official gifts promised her by Governor Tom McCall, who was head of the Oregon Trade Mission to Korea last November. It is hoped these eggs will help increase the salmon runs.

Requests for Eggs Soar

The requests for eggs have skyrocketed in recent years following the successful introduction of coho into Lake Michigan. Eggs from the Oregon Fish Commission were used there.

Ordinarily, the Fish Commission states, eggs that will be shipped by air a long distance are raised to the eyed stage, packaged in special styrofoam containers, and rushed to a jet flight--after telephoning or wiring the recipient of the time of arrival.

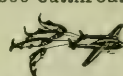
In addition to coho eggs, the Fish Commission sent 1.4 million spring chinook eggs to Washington's Department of Fisheries and 400,000 to the Oregon Game Commission.

Aircraft Planted 4.1 Million Trout in California in 1968

In 1968, 4.1 million trout were planted in California's back-country waters by airplane, reports the Department of Fish and Game.

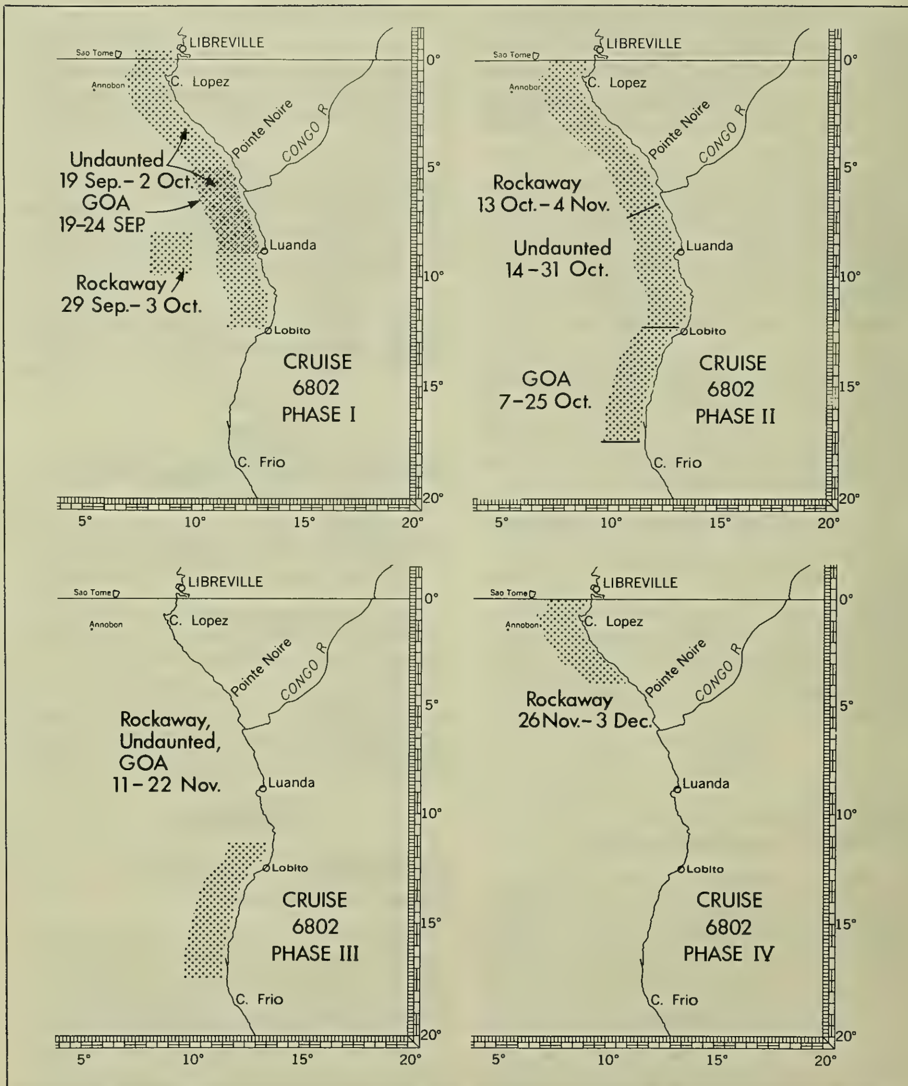
The Department's twin Beechcraft made 93 planting flights covering a total of 871 lakes. Mostly fingerlings were planted.

Plantings included 1,288,400 kokanee salmon fry, 1,565,507 rainbow and kamloops trout, 497,942 eastern brook trout, 567,000 golden trout, 25,150 browns, 12,000 eagle lake trout, and 53,500 cutthroat.



U.S.-Portuguese Cooperative Cruise Off W. Africa

Distribution of tunas and oceanographic conditions off the West Coast of Africa from the equator south to Angola were investigated on a cooperative cruise of BCF's R/V 'Undaunted' (cruise 6802), the U.S. Coast Guard's 'Rockaway,' and the R/V 'Goa' of the Missao de Estudos Bioceanologicos e de Pescas de Angola, Aug. 20-Dec. 18, 1968. As part of the survey, the physical and biological characteristics of the Gabon-Angola front, which moves from the Equator south to off Angola in the southern spring months, were investigated.


LIBREVILLE
Sao Tome
Annobon
C. Lopez
Pointe Noire
CONGO R.
Undaunted
19 Sep.– 2 Oct.
GOA
19–24 SEP.
Luanda
Rockaway
29 Sep.– 3 Oct.
Lobito
CRUISE
6802
PHASE I
C. Frio
Rockaway
13 Oct.– 4 Nov.
Undaunted
14 – 31 Oct.
GOA
7 – 25 Oct.
CRUISE
6802
PHASE II
Rockaway,
Undaunted,
GOA
11 – 22 Nov.
CRUISE
6802
PHASE III
Rockaway
26 Nov.– 3 Dec.
CRUISE
6802
PHASE IV
0°
5°
10°
15°
20°

The frontal movement, its definition by specific isotherms, and the association of tunas with the front were parts of the study.

Tuna Schools Mostly Skipjack

A total of 125 tuna schools were observed, primarily in a restricted coastal band from the Congo River south to Angola. The fish were predominantly skipjack, but yellowfin and other species of tuna also were present. The yellowfin schools occurred in waters warmer than about 23° C. (73° F.), but skipjack were found in waters as cool as 20° C. (68° F.). Preliminary study did not show the tuna in close association with the front, possibly because of the weak nature of this feature during the cruise period.

Commonwealth of Puerto Rico Plans Commercial Fishery Lab

The Puerto Rico Planning Board has approved the preliminary drawings of a commercial fishery laboratory to be built at Punta Guanajibo, south of Mayaguez, on the west coast. The lab will be headquarters for the commercial fishery research and development program of Puerto Rico. This is supported by the Department of Agriculture of the Commonwealth of Puerto Rico and the U.S. Department of the Interior under Public Law 88-309.

Under the development program, several projects are underway to promote the fishing industry. These include demonstration and testing of improved boats and fishing gear, collection of fishery statistics, training of fishermen aboard tuna clippers, and experimental fishing for tuna in the Caribbean Sea and adjacent waters.

The Laboratory

The laboratory will include space for studies related to exploratory fishing, fishing gear, processing and preserving fish, and marine biology. It also will contain a library, assembly room, and administrative offices.

Facilities for docking, and a shipyard, will be constructed near the lab by the Atomic Energy Commission for the University of Puerto Rico Nuclear Center on Puerto Rico (Department of Agriculture property).

Much Fishery Legislation Proposed in Congress

The "hoppers" of the 91st Congress already contain a fair-sized catch of bills concerning fish and their environments and fishery products:

- Marine Sanctuaries

Five bills were introduced in the House to authorize the Secretary of the Interior to study the most feasible and desirable means of establishing certain portions of the tidelands, Outer Continental Shelf, seaward areas, and Great Lakes of the U.S. as marine sanctuaries.

The bills were introduced by Reps. Boland, Mass. (H.R. 145), Wyman, N.H. (H.R. 727), Brown and Keith, Calif. (H.R. 5955 and H.R. 5824), and Rep. Tunney, Calif., who included bays and estuaries (H.R. 6059).

Rep. Brown also introduced H.R. 5956 to authorize the Secretary of the Interior to study the feasible and desirable means of establishing a marine sanctuary in the Santa Barbara Channel, California.

- Territorial Waters and Fishing Zones

Reps. Pelly, Wash., and Clausen, Calif., introduced H.R. 506 and H.R. 3785--to establish fishing zones of the U.S. beyond its territorial seas. Rep. Pelly also introduced H.R. 509 to amend the act prohibiting fishing in U.S. territorial waters by non-U.S. vessels in order to expand the definition of "fisheries."

- Inspection and Labeling

Rep. Sullivan, Mo., introduced H.R. 1235 to protect the public health by amending the Federal Food, Drug, and Cosmetic Act. His bill amends certain labeling provisions. . .to assure adequate information for consumers, including cautionary labeling of articles where needed to prevent accidental injury. . . to provide additional authority to insure wholesomeness of fish and fishery products; etc.

Rep. Pepper, Fla., introduced H.R. 3683--to regulate interstate commerce. . .to provide inspection of facilities in harvesting and processing fish and fishery products for commercial purposes; inspection of fish and fishery products; and for cooperation with States in regulation of intrastate commerce with respect to State fish-inspection programs.

Rep. Pepper also introduced for himself and Rep. Dingell, Mich., H.R. 5550. It is designed to protect consumers and to assist the commercial fishing industry through inspection of establishments processing fish and fishery products.

Rep. Pelly, Wash., introduced H.R. 505. This would require imported fish and fish-food products made completely or partly with imported fish to bear a label showing country of origin.

- Imports

Rep. Pelly introduced H.R. 510. Its purpose is to amend U.S. Tariff Schedules to provide that the amount of groundfish imported shall not exceed average annual amount imported during 1963 and 1964.

- Landings and Processing by Foreign Vessels

Rep. Pelly introduced: 1) H.R. 1272. This seeks to prevent certain foreign-flag vessels from landing catches of fish in U.S. ports, also territories, possessions, and Commonwealth of Puerto Rico.

2) H.R. 507: to prohibit processing of fish in U.S. territorial waters by non-U.S. vessels, except when it is determined that no adequate U.S. processing facilities are available.

- Aid and Assistance to U.S. Fishermen

Rep. Pelly introduced H.R. 1270. This would authorize Coast Guard to protect and assist U.S. vessels fishing on high seas.

Rep. Pelly also introduced H.R. 508--to decrease permissible minimum down-payment for fishing vessels.

Rep. O'Neill, Mass., introduced H.R. 1268. This bill would authorize liens of value of secured equipment used solely for navigation or fishing on a U.S. vessel--and to permit recording of such liens.

- Pesticides

Rep. Dingell, Mich., introduced H.R. 1057: to prevent or minimize injury to fish and wildlife from insecticides, herbicides, fungicides,

and pesticides, etc.; also H.R. 1059: to provide for advance consultation with Fish and Wildlife Service and State wildlife agencies before any Federal program begins involving the use of pesticides or other chemicals designed for mass biological controls.

• Pollution

Rep. Dingell, for himself and Rep. Karth, Minn., introduced: 1) H.R. 1058. This would protect fish, wildlife, and recreation from damages resulting from discharge of heated effluents into certain waters; 2) H.R. 1060 to require certain vessels in U.S. navigable waters to conform to standards of waste disposal; and 3) H.R. 1062: to control pollution from vessels and other sources in Great Lakes and other U.S. navigable waters.

Rep. Cahill, N.J., introduced H.R. 2155 and H.R. 2156. These would give President authority to alleviate or remove threat to navigation, safety, marine resources, or coastal economy by releases of fluids or other substances carried in ocean-going vessels, etc. He also introduced H.R. 2157: to provide Coast Guard with authority to conduct research and development to deal with release of harmful fluids carried in vessels.

Rep. Tunney, Calif., introduced H.R. 6296. It would create commission to make comprehensive study of discharge of oil and other pollutants from vessels, onshore and offshore facilities, and other sources, into or upon navigable waters of U.S. or adjoining shorelines.

Rep. Horton, N.Y., introduced H.R. 6019: to authorize grants for research and development of methods to abate pollution of Lake Ontario, Lake Erie, and for other purposes.

• Anadromous Fish

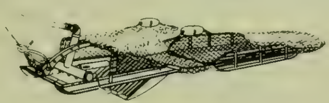
Rep. Dingell, Mich., introduced for himself and others H.R. 1049. This would contribute to conservation and enhancement of U.S. anadromous fishing resources--and encourage joint research and development projects.

Rep. Pelly introduced H.R. 309: to conserve and protect Pacific salmon of North American origin.

--Barbara Lundy

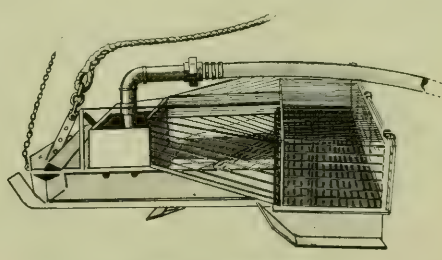
HYDRAULIC OR JET DREDGES

With this type of equipment, surf, soft, or hard clams are washed out of the bottom by action of jets of water from a pipe attached in front of the tooth bar. The pressured water is supplied by a high powered pump on the fishing vessel. The shellfish are then either washed on to, or collected by the tooth bar of the dredge. The Maryland type of hydraulic dredge utilizes a conveyer which brings the soft clams up to the vessel.



Hydraulic or jet dredge, surf clam

Hydraulic or jet dredge, soft clam



Hydraulic or jet dredge, hard clam

Note: Excerpt from Circular 109, Commercial Fishing Gear of the United States, for sale from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402, single copy 40 cents.

OCEANOGRAPHY

International Scientific Expedition Drifts Across Atlantic

In February 1969, U.S., British, and West German scientists spent 3 weeks aboard 4 vessels drifting across the equatorial region of the Atlantic Ocean. They were studying in detail the interaction of sea and air where the tradewinds generate much of the weather for North America and Europe. The study is called the Atlantic Tradewind Experiment (ATEX).

By drifting, rather than sailing, the scientists hoped to conduct their sea/air experiments--and measurements of air and water motions--without the problem of ship movements.

The vessels were ESSA's 'Discoverer,' the British Navy hydrographic survey ship 'Hydra,' and the West German research ships 'Meteor' and 'Planet.' Several German scientists were aboard the U.S. vessel.

The Operation

The 4 ships met off Africa about 850 miles west of Dakar and 600 miles west of the Cape Verde Islands to synchronize instruments. Three vessels then took stations at the corners of an equilateral triangle 435 miles on a side, with the fourth vessel centered on the downwind (South American) side. The vessels began drifting southwestward with the prevailing winds and currents. The ships drifted about 550 miles towards the mouth of the Amazon River off Brazil. At the end of the drift, the ships regrouped to compare results.

Interesting Studies Conducted

One interesting study, by German scientists, dealt with the number and size of raindrops. The results could lead to better understanding of different kinds of rain, especially tropical, and to answers about the artificial production of rain.

Another study involved the concentration and mineralogy of suspended sediment transported by ocean currents. This study may provide information on source of deep-sea deposits. It was conducted along with airborne particle studies.

A third study involved internal waves, the mysterious underwater undulations of the sea.

Hawaii Will Get New Experimental Tsunami Warning System

An experimental system will be set up in Hawaii to try to improve the existing system that warns Hawaiians of seismic sea waves (tsunamis) generated by undersea earthquakes near their coasts. It is hoped the new additional system will provide information sooner.

The program, announced Feb. 11 by the Environmental Science Services Administration (ESSA) of the U.S. Department of Commerce, will be established by ESSA and the University of Hawaii under a $45,700 contract.

The New System

The experimental system will consist of seismic and hydraulic gage stations on several islands. The stations' signals will be telemetered by radio to the observatory of ESSA's Coast and Geodetic Survey (CGS) at Ewa Beach, Oahu.

The system will supplement the existing seismic quadripartite warning net on Oahu. The net is part of the CGS Pacific tsunami warning system. Three seismic stations will be established on the Big Island in cooperation with the U.S. Geological Survey's Hawaii Volcano Observatory; a fourth will be installed on Maui. The system will also use the present hydraulic gage near Kona on Hawaii Island, plus a new one to be installed on the island near Punaluu.

Also, a permanent, ocean-bottom, tsunami recorder using a mid-ocean pressure sensor will be placed under an ocean station ship north of the Hawaiian Islands. The pressure sensor will telemeter wave-height data from sea bottom to ship. From there, the signals will be relayed to the Ewa observatory for analysis.

Swifter Action Expected

Robert A. Eppley, Chief, Tsunami Services Coordinating Branch, Coast Survey headquarters, Rockville, Md., said:

"Having this information immediately available from the continuous recordings at the stations should make it possible, if a large earthquake occurs near the Big Island, the most active seismic area, for the observatory to act swiftly. The seismic data will enable the observatory to determine the earthquake's epicenter and the data from the hydraulic gages will be used to determine if a tsunami has been generated and, in the case of Aleutian tsunamis, to evaluate the wave height as it approaches Hawaii."

If the experimental system provides reliable results, it will be added to the Pacific tsunami warning system. This would reduce appreciably the time in which a warning can be issued.

Eppley said, too, there was always the possibility of a tsunami being generated by an undersea earthquake in the ocean adjacent to Hawaii. Such a tsunami about 100 years ago off the southeast coast of the island of Hawaii caused considerable damage.

"THERMOMETER" TAKES SEA'S TEMPERATURE

The mighty ocean is having its temperature taken in measurements as precise as five-hundredths of a degree Fahrenheit.

The "thermometer", explained Arthur Nelkin, manager of electroacoustics research, Westinghouse Research Laboratories at Pittsburgh, changes electrical pulsations from deep in the ocean into mechanical vibrations of ultrasonic frequency that can be measured on the sea's surface.

The transducer contains a small aluminum disk, about an inch in diameter, which has a natural vibrating frequency of about 40,000 vibrations per second. This disk is lowered into the ocean, attached to two wires which feed it direct current power.

Set in motion by a transistorized electronic circuit, the disk fixes the frequency at which the circuit produces electrical pulsations. These pulses are sent along the wires to receiving equipment on a ship or platform at the water's surface, where they are counted.

The disk's natural vibration rate changes with the ocean's temperature. Temperatures are measured by observing the corresponding shift in frequency of the electrical oscillations.

Accurate knowledge of the ocean's temperatures is aiding scientists in their extensive study of ocean depths and man's relation to the sea. For example, small changes in water temperature are known to affect the performance of sonar systems. (Reprinted, with permission from "Science News," weekly summary of current science, copyright 1966, by Science Service, Inc.).

Foreign Fishing Off U.S. Coasts in December 1968

NORTHWEST ATLANTIC

Thirty-six Soviet, Polish, and Icelandic fishing and support vessels were sighted in December 1968, far fewer than the 92 reported early in November. Due to a complete withdrawal of East and West German fleets and reductions in Soviet and Polish fleets, only 10 or 12 remained at end of November. In December, weekly sightings varied between 10 and 20 vessels.

Soviet: Twenty-nine individual vessels were sighted. Most were concentrated in a 20-mile area, 20 to 30 miles south of Martha's Vineyard and Nantucket. They were observed actively fishing, probably for herring, but no catches were identified.

Polish: Six vessels were sighted, in contrast to 19 in November. Early in the month they fished briefly 25 to 30 miles south of Martha's Vineyard and Nantucket. Limited catches of herring were observed. Two Polish vessels fished briefly south of Block Island, R.I., early in Dec. 1967.

East and West German: There were no sightings in December 1968. In early December 1967, 1 East German and 8 West German stern trawlers fished 15 and 30 miles south of Montauk Point, L.I. By mid-month, they were reported fishing off the New Jersey Coast. At month's end, there were no further sightings or reports of these vessels.

Icelandic: One herring purse seiner sighted.

MID-ATLANTIC

Several Soviet stern factory trawlers were reported southeast of Cape May, N.J., and off the Virginia coast, probably conducting exploratory fishing.

GULF OF MEXICO AND SOUTH ATLANTIC

No foreign fishing vessels were reported.

OFF CALIFORNIA

No Soviet fishing vessels were sighted in December 1968; 18 were sighted in December 1967.

OFF PACIFIC NORTHWEST

Soviet: Three fishing vessels were sighted--1 medium side trawler, 1 research vessel, and 1 large stern factory trawler. No catches were observed.

Japanese: One long liner was sighted, but no fish were observed aboard.

OFF ALASKA

Soviet: Soviet fishery vessels increased rapidly, from 34 in November 1968, to over 110 by the end of December. Number of vessels also had increased rapidly in December 1967, from 20 early in the month to about 70 by the end.

The winter herring fishery began earlier in 1968 than in previous years--the principal reason for the increase in sightings. Their Bering Sea flounder fishery also started early in December.

A fleet of 11 stern trawlers, 1 medium trawler, and 5 support vessels, observed fishing ocean perch in the western Gulf of Alaska during the first 3 weeks in December, had shrunk to 6 stern trawlers by year's end. Many of the vessels offloaded in the Sanak Island loading zone. Ocean perch fishing in other areas off Alaska was limited.

In early December, 5 stern trawlers started fishing herring northwest of the Pribilofs; by month's end nearly 30 vessels were sighted there. The Soviets did not fish Pribilof Island herring in 1966 and 1967; in 1968 they caught about 10,000 metric tons. In December the best stern factory trawlers were landing 35-50 metric tons a day, and some medium trawlers were averaging 12-13 tons, on a good day. Some medium trawlers, with limited refrigeration capabilities, reportedly were having difficulty as they could freeze only about one-half their average daily catches.

About 10 vessels began fishing flounder in early December; by month's end there were over 50. In recent years Soviet flounder expeditions have developed into one of their most intensive fisheries off Alaska.

Throughout December the Soviets trawled for groundfish along the Continental Shelf edge in the Bering Sea. One group of 5 medium trawlers operated in the central Bering Sea. North of the Fox Islands in the eastern Aleutians a second group, 6 medium trawlers, was

joined by 9 sisterships and 2 refrigerated vessels early in December. This second group was visited by a BCF management agent late in the month. The Soviet Commander confirmed that flatfish was the principal catch. For example, on the vessel he was on 95% of the catch was arrowtooth flounder (frozen whole).

Japanese: About 40 vessels were sighted in December.

Six stern trawlers fished ocean perch, mostly in the eastern Gulf of Alaska. Twelve to thirteen stern trawlers fished perch along the Continental Shelf edge from Unimak Pass to the central Bering Sea.

Two factoryship fleets continued the fish meal and oil and minced-fish-meat fishery in the eastern Bering Sea throughout December. One factoryship and 8 trawlers fished along the Continental Shelf edge from north of the Fox Islands to south of the Pribilofs--proven pollock fishing grounds. The second factoryship and 6 trawlers remained north of the Alaska Peninsula--an area of flounder concentrations.

About 4 vessels long lined for sablefish off southeast Alaska during the month.

South Korean: In late December, a stern trawler appeared near the eastern Aleutians. In June and July 1968 the same vessel had fished north of the Alaska Peninsula.

DO YOU KNOW?

The sea lamprey or "lamprey eel," scourge of the Great Lakes, is not an eel. It is a primitive, aquatic, vertebrate that has no jaws or paired fins.

The "mouth," a sucking disc by which the animal attaches to a fish, is surrounded by teeth that are used to rasp a hole through the victim's skin.

Originally, the sea lamprey spent its entire life in salt water and spawned in fresh water. However, the lampreys of the Great Lakes now spend their entire lives in the lakes and adjoining streams.

The nonparasitic young, called ammocetes, remain for several years buried in mud bottoms of the streams. Emerging from the mud as adults, they migrate into the lakes. Later, the lampreys return to the streams to spawn before dying.

Adult lampreys have been responsible for destruction of lake trout, burbot, and whitefish populations of Lakes Superior, Huron, and Michigan. The lamprey population has been reduced more than 85 percent in Lakes Superior and Michigan by chemical control methods recently developed by the Bureau of Commercial Fisheries and applied in a joint U.S.-Canadian control program by personnel of the Bureau of Commercial Fisheries and Department of Fisheries, Canada. As a result, fish stocks in these lakes are now being restored, aided by plantings of hatchery-reared fingerlings.

--Catherine Criscione

JAPANESE LONGLINE FISHERY IN GULF OF ALASKA

Jim H. Branson

Since early 1964, Japanese longline vessels have maintained a fishery for sablefish in the Gulf of Alaska. This fishery remained stable at 8 ships through the first 3 years. In 1967, however, the number of ships jumped to 23, which made at least 30 trips. In 1968, the number was 21 ships and over 43 trips. The catch has increased from 4 million pounds annually in 1964-66 to an estimated 20 million pounds in 1968.

The gear used by the Japanese is capable of taking halibut. Only short distances separate their sablefish operations from some of the best halibut grounds in the North Pacific. For this reason, these ships have been boarded and inspected, whenever possible, by Bureau of Commercial Fisheries personnel, acting under the authority of the International North Pacific Fisheries Convention. To date, only one ship has been found with halibut aboard, and there is reason to believe those fish may have been taken in the Bering Sea.[1/]

Available information indicates the Fisheries Agency of Japan did not license any longliners to fish in the Gulf until September 1967. Prior to that time, in fact, the Agency had punished some ships for fishing there without licenses.

The typical Japanese longliner works alone. It makes trips lasting as long as 3 months, dresses and freezes the catch as it comes aboard, and returns to Japan only when it has a full load. This may be as much as 300 metric tons. The vessels observed in the Gulf of Alaska have hailed from many different ports, and most are owned by small companies or individuals.

The recent increase in the number of Japanese ships in this fishery, some new and apparently designed for fishing in northern waters, may signify increased interest in the sablefish resource of the Gulf. To date, there appears to be little decrease in fishing success, which has been uniformly high since the fishery began.

DEVELOPMENT OF THE FISHERY

The first confirmed sighting of a Japanese longline vessel in the Gulf of Alaska was in April 1964, southwest of Unimak Island. By the end of 1964, 8 different ships had been sighted in the Gulf, some as far east as Middleton Island (long. 146° W.).

By March 1965, Japanese longliners had extended their fishing to the waters off southeastern Alaska, as far east as long. 135° W. Eight individual vessels were identified in 1965.

The fishery did not expand in 1966; in fact, only 7 individual vessels were involved. The effort, however, shifted east again; almost all sightings were made east of Kodiak Island, principally on Middleton and Chichagof grounds.

In 1967, fishing effort more than doubled. Twenty-three boats were reported in the Gulf of Alaska and some made 2 or even 3 trips during the year. Fishing effort was still concentrated east of Kodiak Island, the bulk on Middleton and Chichagof grounds.

In 1968, 22 longliners were licensed by the Japanese Fisheries Agency to fish in the Gulf of Alaska. At least 21 vessels made a total of over 43 trips. Fishing effort shifted even further east: all but 7 expeditions concentrated on the Chichagof grounds.

Observations of this fishery by BCF personnel over the past 4 years indicate the catch is almost entirely sablefish (*Anoplopoma fimbria*). There also are a small percentage of rockfishes (*Sebastodes* sp.) and an occasional halibut (*Hippoglossus stenolepis*).

Mr. Branson is Supervisory Fisheries Management Agent, BCF, Office of Enforcement and Surveillance, Kodiak, Alaska.

1/In early Feb. 1969, a second Japanese longline fishing vessel 'Daiei Maru No. 85' was seized for violation of the Convention. The vessel was fishing in the eastern Gulf of Alaska and had halibut aboard.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 834

Fisheries Management Agents have observed halibut on Japanese longline gear on only 2 occasions since the fishery started in 1964; in both cases, the fish were shaken off the gear without being brought aboard. It appears that only a very small percentage of the catch will be halibut--as long as fishing is confined to 200 fathoms or more, as almost all is.

FISHING GROUNDS AND METHODS

Japanese longline grounds in the Gulf of Alaska can be separated into 7 major areas (fig. 1). These start in the west at approximately long. 165° W. with the banks south of Unimak Pass, progress east through the Shumagins, Chirikof, Kodiak, Middleton, Yakutat, and end with Chichagof at about long. 135° W. All are adjacent to, but outside (deeper), extremely good halibut grounds. slope to abyssal depths. The longliners generally attempt to put their gear on this shelf.

The gear used for sablefish in the Gulf is identical to that used by the Japanese in their longline fishery for halibut in the Bering Sea. Hooks, groundlines, etc., are the same size, and squid is the preferred bait for both species. A unit of gear, called a "set," consists of 80 to 100 meters of approximately $\frac{5}{16}$-inch diameter groundline coiled in a flat wicker and grass basket. Branch lines, or "gangings" in the U.S. fisherman's terminology, are slightly less than 1 meter long; these are placed about 2 meters apart along the groundline, giving an average of 40-50 hooks to the basket. Two hundred fifty to 300 of these sets are tied together to comprise a "longline" that may be 20 miles long.

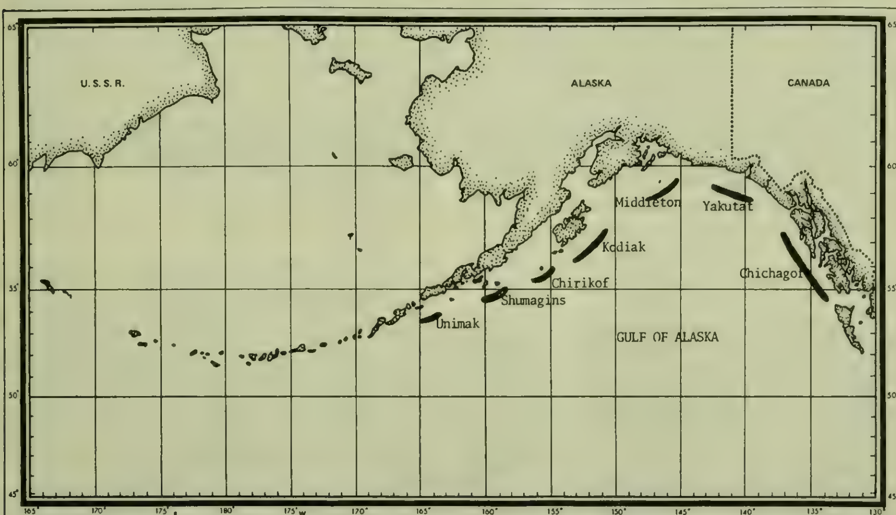


Fig. 1 - Major Japanese longline grounds in the Gulf of Alaska.

The average depth fished by the longliners has been 300 fathoms, although gear has been observed as shallow as 150 fathoms and as deep as 550 fathoms. The line is set along the contours of the bottom rather than across, so most of a set will be at the same average depth. Throughout most of the 7 Gulf areas, there tends to be a narrow shelf ranging from 250 to 350 fathoms, between the break of the Continental Shelf at 100 fathoms and the final

The gear is set through an opening at or near the stern, while the ship is underway at 6 or 7 knots; the ends of the line are marked with buoyed flags and, usually, a radio transmitter buoy. In addition, a buoyed flag may be attached every 100 baskets or sets. The ends of the mainline are anchored. A rock, about the size of a grapefruit, is placed at the junction of each set to hold the groundline on the bottom. The gear is left to soak for

around 5 hours and then picked over a power line hauler or "gurdy." Hauling proceeds at about 3 miles or less per hour, so gear recovery time runs from 6 to 8 hours. The line hauler is positioned on the main deck, usually on the starboard side just forward of the wheelhouse, along with the fish bins and cleaning tables.

The mechanics of the fishing operation are basically the same as those used by U.S. and Canadian longline fishermen. However, because of the small units of gear and the use of baskets, etc., it wastes considerably more manpower. Instead of 6-12 men aboard a comparable U.S. vessel, the Japanese ships average 26-28 men. The Japanese boats are considerably larger than those used in the North American halibut fishery, ranging from 120 to 185 feet.

As the sablefish are brought aboard, they are headed and eviscerated and put in flat metal trays that hold approximately 40 pounds. The loaded trays are placed on shelves in an air-blast freezer usually located on the main deck underneath the wheelhouse. The sharp freeze capacity of the vessels inspected has run from 6 to 12 metric tons per day. After 5-8 hours in the sharp freeze, the fish are knocked out of the trays in blocks and glazed. Then they are shifted to a refrigerated hold, where they remain until delivery in Japan, or transshipment to a refrigerated cargo ship.

VESSELS AND CATCHES

All the ships in the Gulf of Alaska longline fishery have been standard Japanese longliners. These ships have engine, quarters, and pilot house aft, a large working deck running from front of the wheelhouse forward, and equipped with one or more vertical shiv line haulers on the starboard side of the main deck, just forward of the superstructure. They have ranged from 120 to 185 feet long and from 211 to 534 gross tons. All are equipped with refrigeration, and head, eviscerate, and freeze their catch on the grounds. Refrigerated-hold capacity varies from 100 to over 300 metric tons.

Until late 1966, all ships observed in the Gulf had open working decks. These make aerial observation of their catches reasonably easy. In fall 1966, however, a few ships arrived with covered work spaces. These allow only the briefest glimpses of fishing operation from a patrol aircraft or ship. In 1967, some new ships appeared to have this covered working deck as part of their original construction, rather than as a later, temporary, addition. Presumably, the working deck on a longliner is covered only for a northern fishery; open decks are preferable in the southern longline fishery for tuna and billfish. The appearance of original construction aimed solely at a northern water fishery may herald increased Japanese interest in the longline fisheries of the North Pacific and Bering Sea.

Fig. 2 - The longliner, 'Asahi Maru #7,' hauling gear in Gulf of Alaska. Typical of most longliners fishing sablefish off Alaska: machinery and crew spaces are aft, sharp-freeze compartments underneath the wheelhouse, and open working deck. Built in 1963, it is 192 gross tons, 128 feet long, powered by a 6 cylinder slow-speed diesel, and has a crew of 24. The baiting shelter is visible on the stern; so is opening from which gear is set.

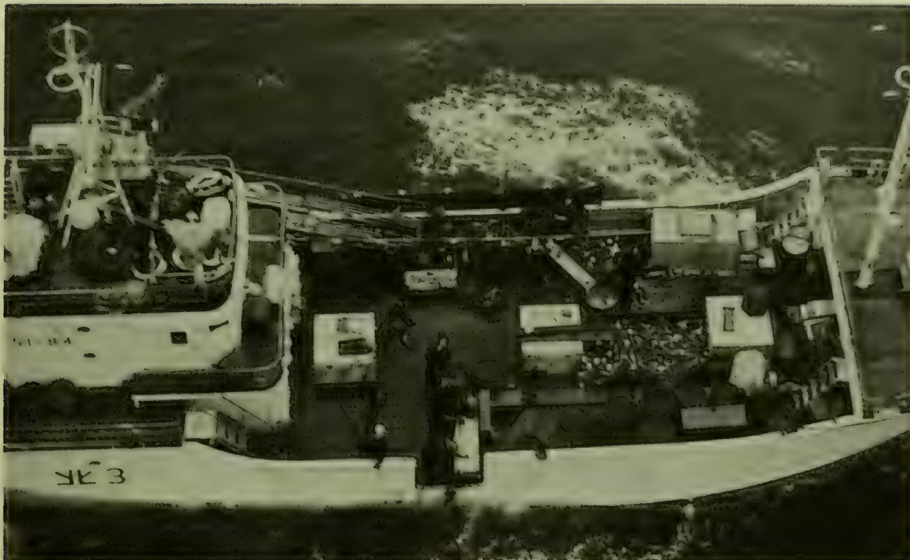


Fig. 3 - Typical deck arrangement for Japanese longliner working sablefish. The line is brought in through cut in bulwarks on starboard side. The fish are dressed on table on port side. Headed and gutted sablefish are visible in bin between #1 and #2 hatch. The rectangular metal freezer trays are visible stacked against break on foredeck. The pipe chute on portside leading aft is used to move baskets of longline gear aft to the baiting shed, where they are recoiled, baited, and reset.

Fig. 4 - The gurdy operator watches longline as it comes aboard over vertical hauling shiv. He gaffs fish and removes them from hook. The fisherman, right foreground, uses long bamboo pole with gaff hook on end to retrieve fish that may fall from gear as they break water. Crewman sitting directly behind gurdy coils skates or sets of the longline in a metal wash pan as they come over gurdy breaking each skate as it comes aboard. When he has one skate in wash pan, he dumps it into flat wicker baskets piled alongside him. Crew member with small gaff hook and basket is picking fish off deck, where they are dropped by gurdy operator. He moves them in basket to dressing tables on portside.

Fig. 5 - The butchering table on portside with gear-return chute visible on left. Fish are headed, eviscerated, and washed with sea water. Then they go down chute on right side into tub full of circulating water. From there they go either to a temporary storage bin or directly into freezer pans. Crew member on extreme right is untangling at least 6 or 7 baskets of longline probably fouled during setting operation.

Fig. 6 - The Japanese longliners dress fish by cutting off head and pectoral fins and then eviscerating without making slit in belly. Fish washed and ready for freezing are in bin in foregound.

Fig. 7 - Crew members bait longline gear with small pieces of squid. A 2-pound squid furnishes about 20 to 25 baits. Gear is set in opening, in background, by moving baskets down long wooden chute. A crew member turns baskets as they are being set, so hooks do not become tangled with gear by dragging across it.

Judging from their registry numbers, the ships observed in the Gulf over the past 5 years have come from at least 7 different prefectures in Japan. Over 13 different owners have been identified, mostly small companies or individuals, although some larger companies, such as Hokoku Suisan K.K., have been represented.

The length of a single fishing trip varies from 6 to 12 weeks; the average is around 9-10 weeks. Traveling time between Japan and the grounds in the middle Gulf of Alaska is 18 or 19 days. Prior to 1968, there was no resupply of the longliners by support ships or other fishing vessels. Recently, however, the Japanese Government has permitted both resupply and transshipment of the catch. Many fishing vessels take advantage of it to stay on the grounds for extended periods.

The average daily catch, according to captains interviewed during the boardings, ranges between 2 and 8 metric tons; the overall average is $4\frac{1}{2}$ metric tons. The size of the individual fish varies from $2\frac{1}{2}$ to over 10 pounds, with the average around 6-8 pounds. There has been little or no reported or observed decline in either daily catch or average size since the first observations in 1964. Generally, success seems to be high in this fishery. BCF personnel have made repeated observations of gear being brought aboard with as many as 75-80 percent of the hooks holding fish.

The yearly take of sablefish by Japanese longliners from the Gulf of Alaska probably averaged about 4 million pounds a year for 1964, 1965, and 1966. This jumped to approximately 12 million pounds in 1967, and again to 18-20 million pounds in 1968. These figures are based on an average vessel capacity of 200 tons and a full load for each trip. The number of trips per year that can be identified were, respectively, 11, 10, 9, 30, and 43. As a comparison, the 1965 catch of sablefish by U.S. fishermen in Alaska was 2,311,000 pounds, and 1,000,000 pounds in 1967.

U.S. SURVEILLANCE AND INSPECTION

The first Japanese longliner was detected in the Gulf of Alaska in 1964 by a joint BCF-Coast Guard aerial patrol out of Kodiak. Since then, a special effort has been made to record the presence of these ships and, whenever possible, board and inspect them for the

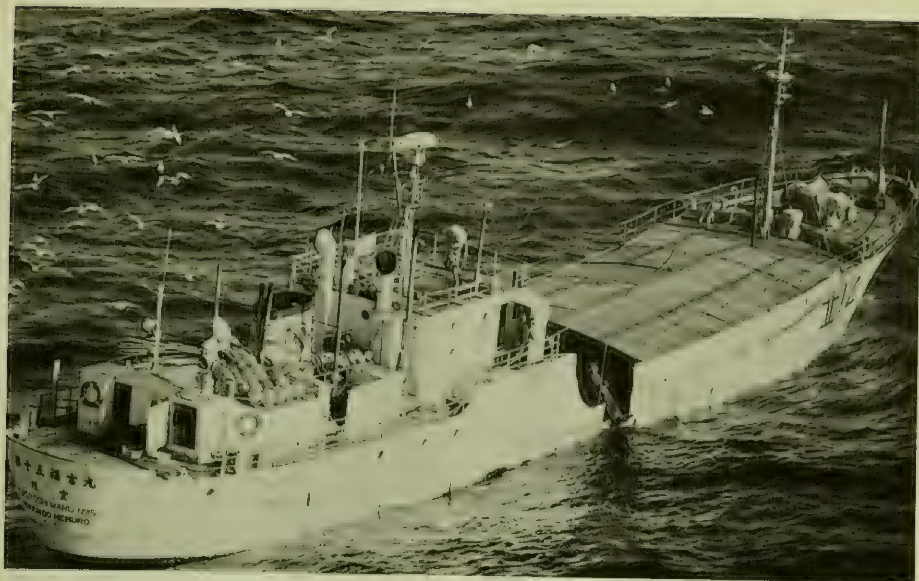


Fig. 8 - A common modification of standard Japanese longliner in Alaskan waters is temporary shelter deck over main working deck. The 'Fukuyoshi Maru #15' was built in 1954. It is 297 gross tons, 135 feet long, powered by a 650 hp. slow-speed diesel, and carries 28 men. The gear is coming over starboard side. The butchering area is out of sight under shelter deck.

Fig. 9 - The 'Eikyu Maru #58' was built in 1967, primarily for the northern water longline fishery. Shelter over working area is permanent and part of original construction. Baiting and gear-setting areas are also enclosed in hull, rather than placed in temporary house on upper deck. The ship is 299 gross tons, 124 feet long, powered by a 700 hp. slow-speed diesel, and has crew of 28.

presence of halibut. Under the International North Pacific Fisheries Convention, parties to which are the U.S., Canada, and Japan, Japan has agreed to refrain from taking halibut of North American origin in the eastern North Pacific. The terms of the Convention authorize the inspection of the ships of one country by officials from another party when there is reasonable cause to suspect a violation.

Of the many Japanese longliners checked by BCF Agents in the Gulf of Alaska, only one vessel, the 'Eitan Maru,' has been found with halibut aboard. There is reason to believe these fish may have been taken in the Bering Sea.

LEGAL ASPECTS OF FISHERY

From the U.S. standpoint, a Japanese longline fishery in the Gulf of Alaska outside of the 12-mile contiguous fishery zone for species other than halibut (*Hippoglossus stenolepis*) or salmon (*Oncorhynchus* spp.) is legal. It is in accord with the provisions of the International Convention for the High Seas Fisheries of the North Pacific Ocean. However, because the Japanese gear used for sablefish and other demersal species in the Gulf is identical to that used for halibut, any such fishery is bound to be a matter of great concern to the U.S. A shift of only a few miles on the fishing grounds could change the Japanese take from almost 100 percent sablefish to nearly 100 percent halibut.

The Government of Japan, which issues licenses to its fishing vessels to fish in specific areas of the world's oceans, apparently did not issue any licenses for longliners in the Pacific east of long. 175° W. until September 1967. Therefore, by Japanese law, the vessels sighted from 1964 through September 1967 were fishing in the Gulf of Alaska illegally. It is known that in several instances, in 1964 and 1965, the Japanese Government took some punitive action against their longliners found fishing in the Gulf of Alaska.

The first full licensing year, 1968, saw 22 ships licensed by the Japanese Government to fish with longline gear for sablefish in the Gulf of Alaska. The Japanese Fisheries Agency operates patrol ships in the North Pacific. However, they seldom work as far east as the longline grounds in the Gulf. As far as is known, none of these ships patrolled the 7 major fishing grounds prior to 1968.

WHY DO TIDE RANGES IN THE SAME GEOGRAPHICAL AREAS OF THE WORLD DIFFER SO GREATLY?

In addition to effects of the moon and sun, tide ranges are affected by shape and dimension of the coastline and sea floor. In some restricted water areas (bays, channels, etc.), heights may build up to 50 feet and tidal currents of as much as 10 knots occur.

Tides moving upstream in an estuary are slowed down by bottom friction, and the following water piles up. The water rises more rapidly than it falls, and the flood stream has higher velocity than the ebb.

Some areas of great tidal ranges are the Bay of Fundy, Bristol Channel, and the Sea of Okhotsk. The famous Bay of Fundy tidal bore moves more than 100 billion tons of water a day.

There are also areas in the world that are almost tideless; among these are the Mediterranean, Baltic, and Adriatic Seas, and the Gulf of Mexico. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

LATE-WINTER WATERS OF YUCATAN STRAITS
A 1968 'Geronimo' Survey in Gulf of Mexico

Reed S. Armstrong

Oceanographic surveys in the Gulf of Mexico have demonstrated that the Yucatan Straits is the area where circulation dynamics are the most intense. For this reason, the water between the Florida Keys, Cuba, and the Yucatan Peninsula was selected for oceanographic investigations during the first manned Apollo spaceflight in 1968. While the spacecraft is operating its sensors, a BCF vessel will survey these waters on a "ground truth" mission. It is hoped this cooperative work will resolve numerous questions about the use of sensors aboard spacecraft to study the oceans.

Between Feb. 8 and March 5, 1968, cruise 20 of the R/V Geronimo (BCF, Galveston, Texas) was made in the Yucatan Straits area (fig. 1). The purposes were to: (1) determine if the survey area was large enough to cover the circulation patterns that might be detected by the Apollo spacecraft sensors--and if the station grid was adequate to bring out these features; and (2) examine the waters in this area of the Gulf of Mexico to establish how the deep water in the Caribbean flows over the relatively shallow sill (about 2,100 m. deep) of the Yucatan Straits.

What Scientists Did

During the cruise, 58 hydrographic stations were occupied to obtain information on temperature, salinity, dissolved oxygen, silicates, and phosphates from the surface to a maximum depth of 4,000 m. In the survey area, 113 bathythermograph casts were made and 34 more casts were made along the return track to Galveston. Additional work during this cruise, not expected to be conducted during the "ground truth" mission, included 96 phytoplankton and zooplankton hauls and 41 sediment grabs and bottom cores.

Temperatures during the cruise were about 25.5° C. or higher in the central part of the survey area but decreased to as low as 20.5° C. north of Campeche Shelf (fig. 2). Temperature on the shelf was about 22.5° C. In the northwestern Straits, the change in surface temperature was as large as 4° C. over a distance of about 56 km. In the central part of the Yucatan Straits, the occurrence of water of about 22.5° C. (surface temperature over the Campeche Shelf) at about 175-200 m. depth proves that upwelling had brought water from about that depth to the surface over the shelf.

Two Cruises Compared

Although reduction of the data has not been completed, the distributions of variables at the surface have indicated some interesting features, particularly when compared to the results of the 12th cruise of the Geronimo a year earlier (Feb. 20 to April 1, 1967). The water temperature was about 0.5° C. lower in the central Straits, and about 3° C. lower on the Campeche Shelf, than during the 1967 cruise. The cool surface water over the shelf north of the Yucatan Peninsula resulted from the upwelling of subsurface water because of the dynamic response to the strong northward current through the Straits.

The temperature differences were considerably greater over the Campeche Shelf than in the central portion during the two cruises. One or more of the following must have occurred: (1) the northward volume transport through the Yucatan Straits was greater in the winter of 1968 than in 1967, thereby causing deeper, colder water to be upwelled during 1968; (2) the northward flow in 1968 was restricted to a narrower width, so that if the volume transport was the same on both occasions, the main flow was confined to a narrow band of high-velocity current in 1968; (3) the core of the current in 1967 was in water so shallow that the bottom physically restricted upwelling; or (4) the winter of 1968 was more severe in the southeastern Gulf (and, therefore, in the northwestern Caribbean)

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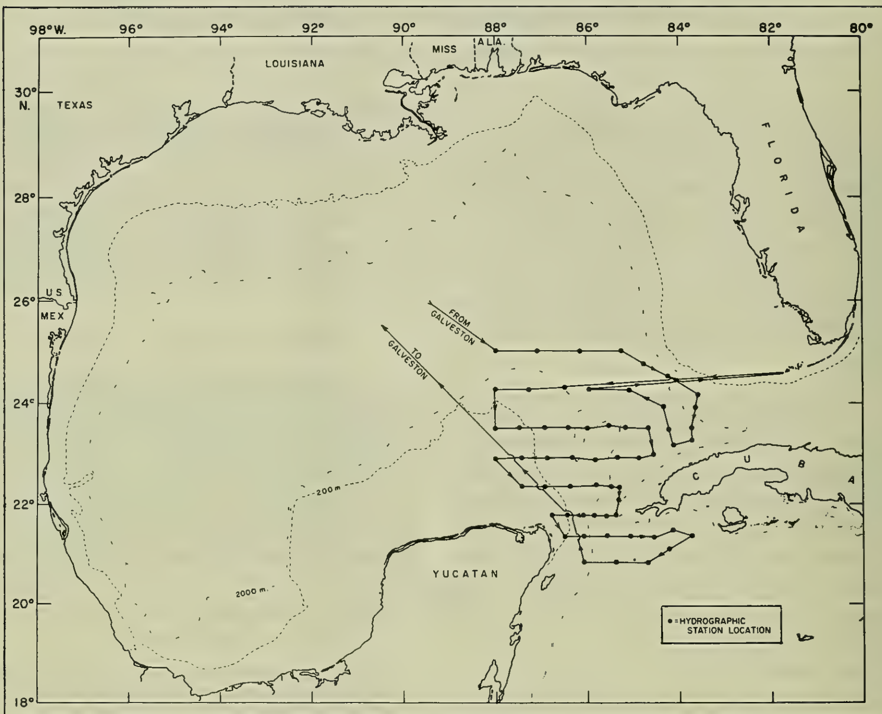


Fig. 1 - Cruise track and station plan for cruise 20 of R/V Geronimo to Yucatan Straits, Feb. 8-March 5, 1968.

than in 1967. To fulfill the last condition, the temperature differences between the two cruise periods would have to be about the same over the entire area, which definitely was not true. The third possibility also can be dropped from consideration because the current core was farther east, in deeper water, in 1967 than in 1968.

Surface salinities in 1968 were 35.8-35.9 p.p.t. (parts per thousand) over most of the central and eastern portion of the survey area--and increased westward to more than 36.5 p.p.t. over a distance of about 65 km. (fig. 3). Maximum surface salinities of about 36.8 p.p.t. were in a cell just north of the western tip of the Yucatan Peninsula. Compared to the surface salinities of the preceding winter, values were about 0.4 p.p.t. higher in the western sector over the shelf, and about 0.1 p.p.t. less over the remaining area. High values on the left-hand side of the northward current were a result of upwelling of deeper, high-salinity water (waters of these salinities were at a depth of about 175-200 m. in the central part of the Yucatan Straits).

The presence of cooler, more saline water over the Campeche Shelf in 1968 indicates that upwelling was more intense than in 1967. Not only was upwelling more intense--but the gradients of temperature and salinity were larger over the continental slope of the Yucatan Peninsula in 1968 than in 1967. Therefore, during winter 1968, the current velocity in the core of the northward flow was greater, and the maximum currents were restricted to a narrower band than during the 1967 cruise.

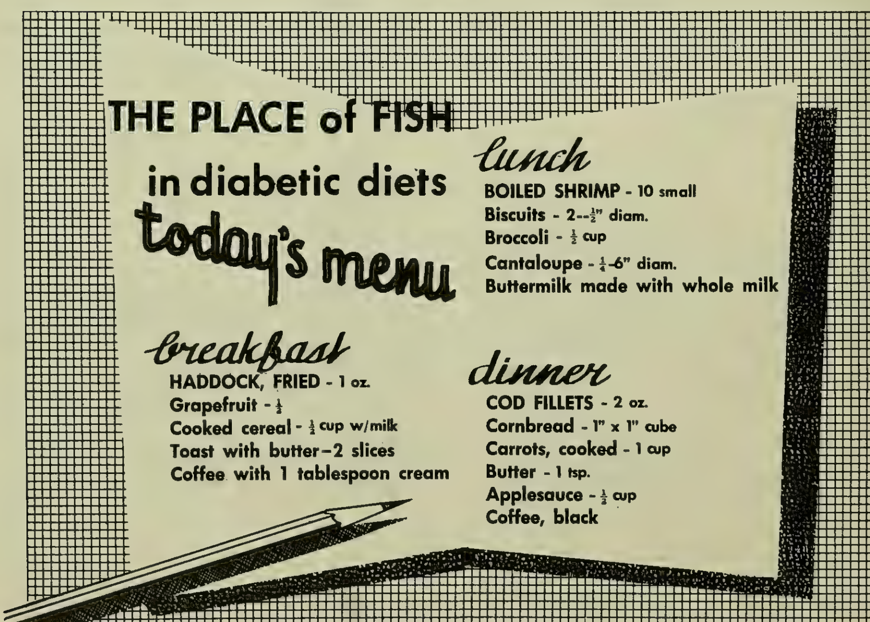
Fig. 2 - Distribution of surface temperature (° C.) and the surface circulation as inferred from the density distribution in the Yucatan Straits and the southern portion of the Gulf of Mexico.

Fig. 3 - Surface salinity distribution (parts per thousand) in the Yucatan Straits and the southern portion of the Gulf of Mexico.

Strong Northward Flow

The predominant feature of the pattern of the surface currents presented in figure 2 (inferred from density distribution at surface) is the strong northward flow along the western side of the Straits. The upwelling over the Campeche Shelf results from this strong current that flows into the Gulf from the Caribbean. A countercurrent off the western tip of Cuba indicates a flow back into the Caribbean. The northward flow and the countercurrent seem to be permanent features. The numerous eddies off the eastern tip of the Yucatan Peninsula indicate a turbulent flow in that area.

A surprising feature in the current pattern is the lack of a well-defined flow and associated upwelling in the southwestern portion of the survey area. The large gradients of temperature and salinity over the slope of the Campeche Shelf should extend southward into the Caribbean. The lack of these gradients, however, probably means that the depth to the bottom below the core of the current and shoreward is so shallow that the bottom physically prevents upwelling in that particular area. The area must be in a turbulent condition that might erode the bottom. Because upwelling could not occur, the dynamics of this turbulent water would require a large slope of the sea surface. The line of eddies indicated in figures 2 and 3, and the presence of the shallow shelf and banks off the western tip of the Yucatan Peninsula, support this concept. If this appraisal is valid, the core of the surface current would have to be near the shore of Yucatan Peninsula--and would be increasingly distant from shore with increasing depth. Analysis of the subsurface data may resolve the question of this interesting feature of the circulation.



UNDERWATER EXPLORATION

'Undersea Frontiers--Exploring by Deep Diving Submarines,' by Gardner Soule, 253 pp., illus., $6.95, 1968. Rand McNally & Co., New York.

"Today a small group of men are exploring landscapes stranger than the surface of the moon and encountering creatures more startling than the monsters of science fiction." This is a book for the commercial fisherman who has everything but a first-hand acquaintance with recent advances in exploring the ocean depths--and who may be unaware of their great potential for supplying man's present as well as future needs. Much of what is recounted was gleaned personally by the author from actual participants in these illuminating investigations.

The latest developments in design, construction, and operation of submarine vehicles are discussed in detail. The success stories of these vehicles--24 of them--are ranged in alphabetical order from 'Aluminaut' and 'Alvin' to the bathyscape 'Trieste.'

The accounts are accompanied by timely information especially interesting to physical oceanographers and geologists looking for mineral outcrops or bottom deposits that might profitably be "mined." Marine biologists will be interested in the notes on animals observed in the course of dives and deep-sea cruises. These range from fish to jellyfish, and include planktonic organisms, plant and animal.

The book is an encyclopedic review of undersea exploration that can be read by specialists and their families for information and entertainment--or as a series of adventure stories rivaling Jules Verne's fictional "Twenty Thousand Leagues Under the Sea."

--W. L. Schmitt

FISHES

'The World of Fishes,' by Brian Vesey-FitzGerald, 128 pp., illus., 1968. Pelham Books, London, England. For most of us, knowledge of fishes is confined to catching and eating them. But angling has a much larger and infinitely more dedicated following than any other field sport. This book is not concerned, however, with the catching of fish nor with cooking them. The fishes occupy a special place in natural history. They live in a medium hostile to us, and one about which we know very little. For all but the specialist, water provides an impenetrable barrier.

Mr. Vesey-FitzGerald explains how fish adapt to life in a strange world of widely varying pressures; how they breathe and reproduce, grow and feed; how they find their way about, making migrations as vast as those of birds. This book, not intended for specialists, takes the reader on an underwater journey through a world teeming with fantastic forms of life.

FISH MIGRATION

'Fish Migration,' by F. R. Harden Jones, illustrated by H. E. Jenner, 325 pp., 86 figs., 38 tables, ref., $21, 1968. St. Martin's Press, New York. No general account of fish migration has been published in the English language since the appearance of Alexander Meek's book in 1916. In 'Fish Migration,' Dr. Harden Jones has summarized the evidence relating to homing and migration in salmon, eel, herring, cod, and plaice. The sensory channels and behavioral mechanisms involved in homing and migration are considered in the light of available data, which are critically reviewed. There are chapters dealing with biological aspects of fish migration and with methods and techniques used in their study.

The work is illustrated with numerous detailed maps, charts, and diagrams, many taken from British Admiralty, Meteorological Office, or Ordinance Survey maps. It will appeal to graduate students and research workers in universities and institutions of zoology, hydrography, and marine biology throughout the world.

CRUSTACEA

'Aspects of the Physiology of Crustacea,' by A. P. M. Lockwood, 328 pp., illus., 1967. W. H. Freeman & Co., San Francisco, Calif.

The crustacea have always been a popular group for physiological research because they show such diversity in body form and mode of life. To the practical researcher, they are particularly attractive because many of the more readily obtainable species are amenable to laboratory rearing and, as a rule, tolerate experimental conditions very well.

This is a concise book suitable as a textbook for senior undergraduates and as background reading for postgraduates. In neither group do potential readers usually have much time to devote to a single topic. The book provides an outline of the physiology of the crustacea which can be read at a few sittings and yet give an overall appreciation of the subject. The coverage is general, but special attention has been given to those aspects where the physiology differs from that of other animal groups.

SEASHELLS

'British Bivalve Seashells,' by Norman Tebble, 212 pp., illus., $3.50, 1966. British Museum, London, England. This handbook describes and illustrates the shells of bivalve molluscs living in the seas around the British Isles. It should be of use to anyone beginning a study of seashells or marine life--the experienced amateur conchologist and the professional zoologist.

TUNA

'Distribution of Skipjack in the Pacific Ocean, Based on Records of Incidental Catches by the Japanese Longline Tuna Fishery,' by Makoto Peter Miyake, Bulletin No. 7, Vol. 12, in English and Spanish, pp. 511-608, $1, 1968. Inter-American Tropical Tuna Commission, La Jolla, Calif. In recent years, it has been found that some tuna fisheries are operating at levels close to, or over, the maximum sustainable catch. At the same time, the world demand for tuna has been steadily increasing. To meet this demand, without further overfishing particular stocks, it will be necessary to increase the production of other species, and to try harvesting tuna at sizes which produce the maximum yield per recruit.

The skipjack, Katsuwonus pelamis, appears to be a species that has not been fully exploited. Extensive surface fisheries exist for it along the coast of the Americas and in waters east and south of Japan. Since skipjack fisheries have been limited thus far to waters relatively close to shore, information on distribution is limited also. The Japanese longline fishery covers almost the entire Pacific, but very few skipjack are caught compared with other species.

All available longline data on skipjack captures in the Pacific by Japanese research vessels (1959-1965), and from incidental skipjack catches by Japanese commercial vessels (1956-1964), are analyzed.

"Early Life History and Spawning of the Albacore, Thunnus alalunga, in Hawaiian Waters," by Howard O. Yoshida, Fishery Bulletin, Vol. 67, No. 2, pp. 205-211, 1968. Fish and Wildlife Service, Dept. of the Interior. Available from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

The albacore in the North Pacific are believed to constitute a single subpopulation, the adults of which support fisheries off the coasts of north America and Japan. The age and growth of adult albacore have been estimated and hypotheses have been developed on their migrations among the fisheries. However, basic information on young albacore before they are recruited into the commercial fisheries is sketchy.

This report treats aspects of the early life history of albacore before their recruitment into the commercial fisheries. Growth in the first year of life is estimated, and inferences are made about the spawning habits of the adults. The juvenile albacore for this study came from the stomachs of billfishes, good collectors of tuna.

The following articles appear in Fishery Bulletin, Vol. 67, No. 1, 1968, Fish and Wildlife Service, Dept. of the Interior. Available from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209:

'Distribution, Apparent Abundance, and Size Composition of Albacore (Thunnus alalunga) taken in the Longline Fishery Based in American Samoa, 1954-65,' by Tamio Otsu, and Ray F. Sumida, pp. 47-69, illus. Before World War II there was almost no longline fishing for tuna in the South Pacific. The fishery began in 1954, when tuna canning began in Pago Pago, American Samoa, with fish delivered by 7 Japanese longliners. A second cannery opened in 1963. By 1965, a 105-vessel fleet was covering about 23 million square kilometers in the central and eastern South Pacific. This paper describes the fishery, gives biological data (size and sex) on albacore, and presents results of some preliminary analyses of the catch rates of albacore as a measure of apparent abundance.

'Micronekton of the Eastern Tropical Pacific Ocean: Family Composition, Distribution, Abundance, and Relations to Tuna,' by Maurice Blackburn, pp. 71-115. To the extent that net hauls sample kinds of micronekton that are important as food for tunas, they can be used to compare quantities of tuna prey in different areas. Because tunas feed on micronekton, a knowledge of its distribution might help to explain the tunas' variable distribution in the eastern tropical Pacific. Comparison of net-caught and tuna-caught micronekton (from tuna stomachs) might be of value in the study of feeding behavior of tunas. Food-chain relations in the ocean have had much physiological and statistical study between the producer and herbivore levels, but comparatively little study has been made between those levels and the carnivore levels. This paper summarizes most of the micronekton data obtained before 1964 in the eastern tropical Pacific and analyzes them in reference to distribution and relation to contents of tuna stomachs.

SALMON

'Spawning Areas and Abundance of Chinook Salmon (Oncorhynchus tshawytscha) in the Columbia River Basin--Past and Present,' by Leonard A. Fulton, SSR-F No. 571, 26 pp., 1968. Fish and Wildlife Service, Dept. of the Interior. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

Chinook salmon formerly spawned in the main stream and in nearly every accessible tributary of the Columbia River. This species is the most important of the area in total population, poundage harvested, and in value to commercial and sport fisheries. The catch declined from 19.5 million kilograms (kg.) in 1883 to an annual average during 1962-66 of about 2.3 million kg. The decline has been attributed to the advance of civilization in the Pacific Northwest. Irrigation, logging, mining, dam construction, and other activities reduced the size and capacity of spawning areas. Resolution of the problems of safely passing migrating salmonids--particularly young downstream migrants--has not kept pace with dam construction in the Columbia River drainage.

To plan research effectively, and to aid management of the remaining runs of Columbia River chinook salmon, it was necessary to review the many reports available on spawning of salmonids. There is a need for published summaries that are comprehensive and cover the entire Columbia River basin. This report on chinook salmon is intended to fill that need.

FISH PASSAGE

'Diel Movement and Vertical Distribution of Juvenile Anadromous Fish in Turbine Intakes,' by Clifford W. Long, Fishery Bulletin, Vol. 66, No. 3, pp. 599-609, 1968. Fish and Wildlife Service, Dept. of the Interior.

The behavior of fingerling salmonids in turbine intakes, including their time of passage and distribution in the water mass, can profoundly influence development of efficient and economical methods for reducing fish mortality in turbines. The need for fish protection at dams is becoming particularly acute in the Columbia Basin because the progeny of upriver stocks of salmonids soon will be forced to pass through the turbines of 8 to 10 dams to reach the sea.

This paper reports on experiments at two dams on the Columbia River to acquire data on timing and distribution of fingerling salmonids entering turbine intakes.

GREAT LAKES

'Plankton Studies in the Largest Great Lakes of the World,' by Charles C. Davis, and 'A Review of Great Lakes Benthos Research,' by E. Bennette Henson, Publication No. 14, 54 pp., illus., 1966. Great Lakes Research Division, Univ. of Michigan, Ann Arbor.

Biological investigation of the St. Lawrence Great Lakes began about 1890 and has continued at an increasing rate, with a distinct upsurge in the past decade. This upsurge is due to a national and regional interest in the lakes as a water resource. It is a resource of such importance that a management program must be effected. Published results of the numerous studies on the lakes are scattered through government reports, scientific journals, notes from industry, sports magazines, and special publications. Drs. Charles Davis and E. Bennette Henson have written these papers in an attempt to review the work in the areas of benthos and plankton, and to compile a complete bibliography.

ALASKA

'A Limnological Reconnaissance in Interior Alaska,' by Gene E. Likens and Philip L. Johnson, Research Report 239, 45 pp., illus., 1968. U. S. Army Materiel Command, Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.

The aquatic environments in arctic and subarctic areas are, for the most part, little known. Numerous data are available on the quantity and chemical quality of river waters in Alaska, but relatively little is known about their biological and physical factors. Very little limnological information is available on the abundant lake habitats. Furthermore, few data are available on the interaction of organisms and these aquatic environments. Yet these ecological features seem to be very important to man's consideration of future use and development of the cold regions.

The physical, chemical, and biological features of river and lake waters are important with regard to sources of potable water, transportation, and industrial development. Understanding these features is also basic to understanding organic production and food supply. A reconnaissance to obtain information about various aquatic habitats in Alaska, particularly lakes, was begun in 1964 and continued in 1965. This report concerns the information gathered on about 40 lakes and other aquatic environments.

'Oceanographic Surveys of Traitors Cove, Revillagigedo Island, Alaska,' by Douglas R. McLain, SSR-F No. 576, 15 pp., illus., 1968. Fish and Wildlife Service, Dept. of the Interior. Available from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209.

Pink salmon (*Oncorhynchus gorbuscha*) and chum salmon (*O. keta*) spawn in the gravels of many of the streams of southeastern Alaska. In the spring, the juvenile fish emerge from the gravel and soon migrate downstream to salt water. Their first few weeks in salt water are a critical period in their life cycles. Probably a large portion of the total ocean mortality of these fish takes place during this period.

Relatively little is known of the oceanography of the salt-water areas in southeastern Alaska, where this mortality occurs. The paper describes a study of water temperature, chemistry, and surface currents of such an area--Traitors Cove, a small fiordlike estuary near Ketchikan, in southeastern Alaska.

FISH DISEASES

'Diseases of Fishes,' by C. van Duijn, Jr., 2nd edition, 309 pp., illus., \$9.50, 1967. Charles C. Thomas, Springfield, Ill. The new edition of this book dealing with the identification and treatment of fish diseases has been updated and expanded to include new knowledge about therapy and drugs. The 1956 edition was intended for aquarists and pondkeepers. It met with such enthusiasm and approval from professional fish breeders that this new edition includes even more information regarding diseases of economic importance.

MARINE MICROORGANISMS

'Microbial Population of Oceans and Seas,' by A. E. Kriss, I. E. Mishustina, I. N. Mitskevich, and E. V. Zemtsova, edited by Gordon E. Fogg, translated by K. Syers, 287 pp., maps, \$16.50, 1967. St. Martin's Press, New York. This survey of the distribution of marine microorganisms could be a starting point for much future investigation into the occurrence and activities of microorganisms responsible for the chemical and biological processes which take place in the ocean.

--Barbara Lundy

INTERNATIONAL

Swedish FPC Used in Biafra

By late November 1968, initial field tests of fish protein concentrate (FPC) in Biafra had produced very satisfactory results. Only half of the 20-metric-ton order had been sent by the Swedish producer ASTRA, but the remainder was scheduled for early delivery.

Tested on Children

Most of the FPC was distributed by the Lutheran Aid Society. However, the Swedish Red Cross distributed half a metric ton to be used under controlled conditions at a field hospital. Two hundred children suffering from protein deficiency were given FPC, and 260 were given protein in the form of milk. Ninety-five percent of the children receiving milk protein suffered from diarrhea and recovered more slowly. No diarrhea appeared in those receiving FPC and, on the average, they recovered 30% faster. The children in both groups were between 1 and 5 years old. They were given the protein supplements together with carbohydrates from indigenous root foods.

Unflavored FPC Favored

It may be desirable to have the FPC in a pure unflavored form, rather than chocolate-flavored, as the initial shipment was. Pure FPC would be easier to use in the field because it could be mixed directly with local root foods.

First Use By People

The FPC distribution in Biafra was the first significant use of Swedish FPC for human consumption. Previous supplies of FPC from ASTRA have been used as a protein additive in livestock feed. (U.S. Embassy, Stockholm, Nov. 26, 1968.)

France & U.S. Will Cooperate in Oceanography

The U.S. and France have agreed to cooperate informally in oceanographic work. The two countries will promote direct contacts between U.S. and French specialists--and annual meetings between the U.S. Marine Council and CNEXO (French National Center for Exploitation of Oceans).

Some possible areas of cooperation include fish protein concentrate (FPC), ocean pollution, research personnel training, and technology of deep diving.

Lucien Laubier, Deputy Director of the Banyuls Laboratory, will be the French contact for the FPC phase of the program. His U.S. counterpart will be H.E. Crowther, Director of BCF. (U.S. Dept. of State, Nov. 9, 1968.)

Shipping Exhibition Scheduled for Greece

An international shipping exhibition, 'Posidonia '69,' will be held in Athens, Greece, June 2-8, 1969. 'Posidonia '69' will set a completely new trend in international shipping exhibitions.

It will be the first international exhibition of its type aimed specifically at the Greek shipping market. Exhibitors will receive free marketing and other expert advice before, during, and after the event. The exhibition will be open evenings only.

Most Space Already Taken

Most of the available stand space has already been filled. Britain, the Netherlands, Italy, West Germany, Norway, Japan, Switzerland, and Greece are taking part. They may be joined by exhibitors from the U.S., Denmark, France, and Spain.

Shipbuilding, ship repairing, marine engineering, all types of equipment, shipbrokering, bunkering, insurance, and banking will be represented.

'Posidonia '69' will give the worldwide marine industry an opportunity to show its wares on the doorstep of the world's second largest shipping market. ("Alieia.")

Conference Slated on Fish Inspection and Quality Control

An FAO-sponsored International Technical Conference on Fish Inspection and Quality Control is to be held in Halifax, N.S., July 15-25, 1969. As many as 300 delegates and observers from 40 countries are expected.

Conference arrangements grew out of the work of the Codex Alimentarius Commission, a joint FAO-World Health Organization body established to formulate international quality standards for food products. Standards for several fishery products should be available in a few years; inspection systems are considered necessary to ensure compliance.

Proposed in 1964

In 1964, the Committee of Experts on International Standards for Fish and Fishery Products recommended an international conference to exchange technical information among technologists, industrialists, and research workers.

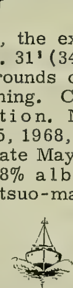
The Halifax conference should foster an understanding of fish-inspection principles and general agreement on the most effective inspection techniques. (Canadian Dept. of Fisheries.)

Japanese Tuna Seining Off Africa Slow

In November 1968, 7 Japanese purse-seine units fishing in the eastern Atlantic off west Africa landed about 2,000 tons of tuna, mostly skipjack. Fishing is steadily falling off and no information has been released on fleet operations during the slow fishing season. ("Katsuo-maguro Tsushin," Dec. 13, 1968.)

Japanese Tuna Fishing Off Chile Poor

In Dec. 1968, the exploratory long-liner 'Azuma Maru No. 31' (340 gross tons), seeking new tuna grounds off central Chile, reported poor fishing. Catches averaged 0.5 ton per operation. No bluefin tuna were found. By Dec. 5, 1968, vessel's catch since survey began in late May 1968 was 203 tons--67% big-eyed, 18% albacore, and 15% unclassified. ("Katsuo-maguro Tsushin," Dec. 16, 1968.)



Japan-Mauritania Fishery Talks Break Off

Private negotiations between Japan and Mauritania in progress at Port Etienne since Dec. 5, 1968, to allow Japanese vessels to fish inside Mauritania's 12-mile exclusive fishery zone, were suddenly terminated Dec. 10. Conditions set by Mauritania were unacceptable to Japan. These negotiations followed up earlier talks held in Tokyo, where the Mauritanians had shown considerable flexibility.

Japanese Proposals

The Japanese negotiators were seeking Mauritania's permission for Japanese trawlers to fish inside Mauritanian-claimed waters on payment of an entry fee. Also under discussion were extension by Japan of close to US$278,000 annually in fishery cooperation funds, and arrangements to buy Mauritania's fish.

The Japanese had hoped to reach an agreement enabling 69 Japanese trawlers, operating off west Africa, to fish for octopus in Mauritanian waters in 1969, during the peak season from January to April. ("Suisan Keizai Shimbun," Dec. 16, and "Suisan Tsushin," Dec. 7, 1968.)

El Salvador to Get South Korean Study Team

South Korea planned to send a 3-man fishery study team to El Salvador in late January 1969. Purpose of the month-long visit was to study the possibilities of developing El Salvador's fisheries. Two weeks will be spent in field surveys, one week reviewing the field work, and one week preparing a report.

S. Korean Plans

If all goes well, South Korean boats will operate from El Salvador ports, principally for tuna, and possibly for shrimp and other species. The Koreans will train 2 or 3 El Salvador fishermen/operators, probably at the FAO deep-sea fishery training center in Pusan, South Korea. (U.S. Embassy, Tokyo, Jan. 7, 1969.)

Norwegian-USSR Sealing Commission Meets

The 11th Session of the Norwegian-Soviet Sealing Commission was held in Moscow Dec. 11-13, 1968. It was attended by scientists and fishery administrators from both countries. Seal catches of the two nations in 1968 and plans for 1969 scientific investigations on the sealing stock in the Northeast Atlantic were discussed.

According to the Norwegian press, the Soviet Commissioners expressed a wish for further Norwegian measures to limit seal catches. The Norwegian Commissioners, however, considered their current measures sufficient to preserve the seal stocks.

1968 Catches

Norway has shortened the seal-hunting season. Her participation in Northeast Atlantic sealing is limited to vessels of less than 100 gross registered tons. In 1968, Norwegians caught 15,000 seals with 5 vessels. Soviet seal hunting, which is land-based, is limited to an annual catch of 20,000 animals.

The 12th session of the Commission will be in Oslo in November or December 1969. (U.S. Embassy, Oslo, Dec. 24, 1968.)

USSR & Iceland Renew Trade Agreement

The Soviet-Icelandic trade agreement, scheduled to expire at the end of 1968, was renewed for 3 years (1969-1971) in late August 1968. The agreement covers Soviet exports to Iceland of petroleum products, machinery, and equipment (fish processing machinery, ships and ship equipment, etc.); and Icelandic exports to the Soviet Union of frozen fish, salted and frozen herring, canned or preserved fishery products, fishing gear, etc.

New Import Quotas

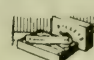
A minimum and maximum annual quota range of 4,000-6,000 metric tons for Icelandic exports of whole frozen fish and frozen herring was established under the new agreement. This gives the Soviets greater flexibility in annual purchases than the expired agreement, which provided for an annual 5,000 ton purchase of those items.

The Soviet annual import quota for frozen fish fillets remained unchanged at 12,000-15,000 tons; salted herring quota is 10,000-12,000 (3,000 tons less than under the expired agreement); quota for canned or preserved fishery products ranges from 31.5 to 50 million kroner (US$552,600-877,000).

Some Quotas Not Set

Fixed annual quotas have not been established for Soviet imports of Icelandic fish nets, lines and ropes, nor for Icelandic imports of Soviet fish processing machinery, ships and ship equipment. (U.S. Embassy, Reykjavik, Sept. 5, 1968.)

Note: It is not known if any arrangements were made with regard to the agreement after Iceland's kroner devaluation on Nov. 12, 1968. Therefore, the old conversion rate of 56.93 kroner to US$1 has been used.



FOREIGN

CANADA

NEWFOUNDLAND WILL BUY FISH PLANTS

The Newfoundland Government will purchase the facilities of North Eastern Fish Industries, Ltd. (NEFI) to prevent their closedown when Unilever, Ltd., ceases operation at the end of January 1969. The province will buy 4 processing plants: one each at Harbour Grace, Old Perlican, Fermeuse, and Port-de-Grace; the fish-meal plant associated with the Harbour Grace facility; 4 working deep-sea draggers and a training ship; and 18 homes built for NEFI personnel. The estimated value is C$12 million. No indication was given of the funds' source. At full production, the plants employ about 800 persons and purchase fish from 1,200 inshore fishermen.

Why Industry Is Slipping

The Government will keep the plants going until a private operator is found. The fish processors claim that foreign subsidies are responsible for the low prices paid for Newfoundland fish in the U.S. market. Other observers contend that conditions in the local industry explain the Europeans' success at Newfoundland's expense. These conditions include: outdated fishing methods and equipment, undersized catch, inferior product, and operating methods unsuited to local conditions, particularly by British parent firms such as Unilever and the Ross Group. (U.S. Consul, St. John's, Dec. 19, 1968.)

* * *

NEWFOUNDLAND SHRIMP

Ever since the Canadian Department of Fisheries began to explore the possibilities of shrimp fisheries along Newfoundland's west coast, rumors have been circulating that it was a large untapped resource. It now appears that the number of shrimp available is relatively small; only supervised commercial exploitation can determine what amount of harvesting the resource can carry. Local fisheries officials do not believe the resource can stand any large-scale commercial exploitation.

Location of Shrimp

Initially, it was thought that shrimp were available only in the area immediately adjacent to Point Riche. New explorations have indicated a considerable quantity of relatively small shrimp available south from Point Riche to Cow Head. A slightly larger variety is found on the south coast east of Ramea, and in St. Mary's Bay.

Lack of Processing Plant

The Canadian Department of Fisheries will continue exploratory work for the next 3 to 4 years. However, it is looking to commercial fishermen to determine by actual trawling the extent to which shrimp can be harvested, particularly along the west coast. One problem is the area's lack of adequate canning or freezing facilities. With a plant available, unshelled shrimp could be frozen and shipped directly. Until one is built there will be no market for commercial exploitation, except for local fresh product sales.

Dangers of Exploitation

Fisheries officials are extremely cautious in discussing shellfish exploitation in Newfoundland because of the recent overexploitation of scallops. They also fear for the lobster harvest as there is constant danger that overeager fishermen will harvest the female before she can lay her eggs. So Department scientists are keeping close watch on all harvesting of shellfish off the coast of Newfoundland. (U.S. Consul, St. John's, Nov. 21, 1968.)

* * *

NEWFOUNDLAND FISH-MEAL PLANT REBUILT

International Fisheries and Fish Meal, Ltd., plans to reopen a fish-meal plant at Port Harmon, Newfoundland, soon. The plant was almost destroyed by fire early in 1968. International Fisheries is a subsidiary of Litton-Grace Industries.

The plant will employ 30 people and provide markets for the local herring fishermen. A small net-repair operation associated with

Canada (Contd.):

the plant has been supplying trawlers based in the area. (U.S. Consul, St. John's, Oct. 30, 1968.)

* * *

CHANGE SALMON LICENSING PROGRAM

The privilege of fishing salmon will be given to all west coast commercial fishing vessels that had recorded landings of any species in 1967 or before September 6, 1968. This extends the salmon license program effected in fall 1968, and allows halibut, herring, groundfish, and shellfish boat owners to fish for salmon. They have until May 31, 1969 to decide.

Salmon Fleet

There are now 7,000 Class 'A' and 'B' salmon boats, a reduction of 1,200 since the salmon restriction license scheme went into effect September 6, 1968. Another category has been added, Class 'C', for boats not wishing to fish salmon. A maximum of about 160 boats, excluded from the initial salmon program, will be affected under this plan if all choose to come in. About 65 halibut boats, 40 that fish for groundfish, 25 shellfish boats, and 30 other type boats will now be able to fish salmon. Boats that come into this scheme will be under the same restrictions announced for salmon boats in September 1968. ("Fisheries News," Nov. 21, 1968.)

* * *

TO CONVERT RETIRED WEATHER SHIPS TO FPC FACTORY SHIPS

A Vancouver, B.C., firm has purchased 2 surplus weather ships for conversion to FPC factory ships. They will be used on the east and west coasts of Canada. Each ship, trawling for about 200 tons of hake, turbot, herring, dogfish, and perch a day, will convert the catch to 40 tons of powdered FPC and 8 tons of oil.

Target Date: July 1969

The company will operate under a U.S. firm's license. It will hold 7 Canadian patents for the azeotropic solvent extraction process. Communist China may purchase the entire west coast output. First conversion on the west coast should be completed by July 1969. About 28 men will be required for navigation and fishing, and 6 to man 3 shifts in the factory area. ("Fishing News International," Dec. 1968.)

* * *

ARTIFICIAL CULTCH DEVELOPED FOR OYSTERS

An artificial cultch, developed by the British Columbia Research Council, is said to have many advantages over the mature oyster shells commonly used in oyster farming. The cultch is being tested in Pendrell Sound.

During commercial transplanting of oysters to new beds, the very young oysters are collected in the water on cultch, a solid material, mainly mature oyster shells.

Advantages of New Cultch

The new artificial cultch is uniform in size and shape, permitting convenient packing, and is shaped to minimize silting of surfaces by bottom mud. As it disintegrates in sea water after about a year, individual oysters on the same piece of cultch do not crowd and compete with each other.

* * *

MIDWATER HERRING TRAWLING SUCCESSFUL

Huge midwater trawl catches of Atlantic herring in the Gulf of St. Lawrence have shown that trials of this method, pioneered by the Departments of Fisheries of Canada and Nova Scotia, have proved successful. A record 1,200-ton catch was made early in November 1968, by the 'J.B. Nickerson,' a 156-foot stern ramp trawler. It showed the method, previously proved feasible with smaller vessels, can be adopted by larger trawlers. J.B. Nickerson is the first of her size to try midwater trawling for herring.

Nickerson Catches

On November 2, 1968, the J.B. Nickerson landed 428 tons of herring. Four days later, she arrived in port with 499 tons and, on November 9, brought in another 300. The 300-ton catch, made in a single night, would have been greater, but bad weather put a stop to fishing. All catches were made at night in the Bird Rock area off the Magdalen Islands. Catches were landed at Caraquet, N.B., for fish meal production. (Canadian Dept. of Fisheries, Nov. 20, 1968.)

EUROPE

Norway

TROUT ARE RAISED IN SEA WATER

A new method of raising trout has been developed in the Sunnmøre district of Norway in the past decade. Instead of keeping the fish in fresh-water tanks and pools, they are reared in sea water rich in the natural nutriment enjoyed by sea trout and salmon. In this way, qualities of pigment, aroma, and taste are achieved that are superior to those of trout raised in fresh water.

The fish are almost all rainbow trout, a particularly adaptable variety. Like salmon, rainbow trout are spawned in fresh water but grow and flourish most noticeably in sea water. They thrive particularly well in the temperate waters of the Gulf Stream zone along the Norwegian west coast.

Co-op Formed

Sunnmøre is the geographical center of the district of the same name. In Sunnmøre's main town, Alesund, the trout farmers have established a cooperative, Norsk Ørretomsetning S/L. Export inquiries are handled by Ferskfiskutvalget, Alesund.

The so-called salmon trout of Sunnmøre differs considerably from ordinary rainbow trout. This is due particularly to the salmon-red coloring of the meat and its taste and texture. Especially when smoked, it can be mistaken for salmon; however, the salmon trout contains fewer calories and is less fatty than salmon.

Output Still Small

Output is modest. Exports have been chiefly to Sweden, where there is a heavy demand for the salmon trout. Production is being increased gradually to satisfy markets in other countries.

Price is higher than for rainbow trout but lower than for salmon. ("Norway Exports.")

* * *

DEVELOPS MACHINE FOR BAITING LONG LINES

A Norwegian firm, Trio Maskinindustri, has developed a machine for baiting long lines. It will bait 2 hooks a second while the vessel maintains a speed of 6 m.p.h. Hooks, on dropper lines one fathom long, are baited with herring. If tests are satisfactory, the machine will be produced to sell for US$1,060 to $1,450. (Reg. Fish. Attaché, U.S. Embassy, Copenhagen.)

Denmark

LANDS LARGE REFRIGERATED SEA WATER-PRESERVED CATCH

In mid-November 1968, the Faroese power-block purse seiner 'Solborg' landed the largest catch of fish ever brought by a single vessel into the North Sea port of Hirtshals, Denmark. The catch, 260 metric tons of mackerel, preserved in Solborg's refrigerated sea water (RSW) tanks, was expected to be worth about US$26,600.

RSW-preservation has been hailed as a giant step forward for the Danish fishing industry. The Dutch have offered sharp competition in supplying herring and mackerel to the big West German canning industry. (U.S. Embassy, Copenhagen, Nov. 26, 1968.)

* * *

FAROESE MAY PUSH FOR 16-MILE FISHING LIMIT

The Faroese fishermen's association favors extending the present 12-mile fishing limit to 16. Faroese say that stocks of cod and haddock inside the limit have increased greatly since it was set at 12 miles and foreign fishermen were excluded. No official comment has yet been made on fishermen's demand.

EFTA Responsibilities

As EFTA members, they would be prevented from extending the limits. They had

Denmark (Contd.):

joined EFTA primarily to avoid British customs duty on frozen fillets. Now that Britain has extended the duty to EFTA countries, there is no reason for the Faroe Islands to continue as members. In fact, a bill has been introduced in parliament to withdraw from EFTA. (Asst. Reg. Fish. Attaché, U.S. Embassy, Copenhagen, Nov. 26, 1968.)

* * *

FAROESE RECEIVE FIRST FACTORY TRAWLER

The 'Stella Kristina,' the first Faroese factory stern trawler, was built in Norway. It is 203 feet long, has a beam of 33 feet, and is powered by a 2,200-hp. diesel. The vessel can produce 36 tons of frozen fillets in 24 hours and can carry 700 tons in her cold-storage holds. Both bottom and midwater trawls can be operated using 8 remote control winches on the trawl deck. Fish are gutted by hand, but all other operations are by machine. Conveyer systems are used for all transport until the frozen fillets are placed in cold storage.

Modern Equipment

Stella Kristina is equipped with modern fish-finding and navigating equipment, including echo-sounder, ASDIC, netsonde, and a 1,200-watt transmitter. The factory deck has 2 fillet lines, one each for small and large fish. Fillets are collected in the center and packed in 5.5-lb. cartons for the 3 freezer units; each unit can handle 12 tons in 24 hours. After freezing, fillets are removed from the small cartons and repacked in larger boxes before being carried by conveyer to the cold-storage hold.

Sistership

A sistership to Stella Kristina will be delivered in April 1969. There are plans to order a third, and perhaps a fourth, vessel in the series. (U.S. Embassy, Copenhagen, Dec. 30, 1968.)

* * *

INDUSTRIAL FISHERY IN ESBJERG BOOMING

During the first 10 months of 1968, industrial fishery landings in Esbjerg exceeded 500,000 metric tons. This is considered fantastic by local experts, who had predicted earlier that landings might reach this level by 1980. About 325,000 tons were landed in same period 1967. Reasons for increase include excellent weather in 1968 and great abundance of North Sea stocks of industrial species.

Co-op Busy

At Esbjerg's largest fish meal and oil cooperative, spokesmen noted that landings from their 330 member vessels had exceeded predicted landings by 100,000 tons. The plant has been able to process 1,200-1,300 tons of fish a day throughout the entire year without difficulty. However, experts warn against counting on such landings in future years. (U.S. Embassy, Copenhagen, Nov. 26, 1968.)

France

BRITTANY TO ESTABLISH SINGLE FISHING POLICY

A single fishing policy is to be established by 14 ports in Brittany to combat generally deteriorating conditions in the area. The ports are Morgat, Douarnenez, Audierne, St. Guenole, Kerity, Guilvienec, Lesconil, Loctudy, Concarneau, Moelan, Lorient, Etel, Camret, and Quiberon. Lorient, Concarneau, and Douarnenez are the 2nd, 3rd, and 5th largest ports in France, producing about 15% of the national catch.

In 1968, these ports suffered from low prices and small catches. Lack of cooperation between fishing enterprises in the region has not helped.

New Organization Formed

An organization, 'Groupement des Peches Maritimes Bretonnes,' has been formed to advance the industry. It will include vessel owners, crews, manufacturers, wholesalers, canners, and exporters. About 35,000

France (Contd.):

people--$\frac{1}{3}$ of all the people employed in fisheries in France--will be affected. The organization intends to use all practical means to facilitate or develop the economic activity of its members, to attract the attention of the European Economic Council, and to help industry members solve their problems jointly. The organization, headquartered in Concarneau, will have a Council of Administration of 14 elected members. ("Fishing News International," Dec. 1968.)

USSR

LONG-LINERS TO FISH COD AND HALIBUT IN NORTH ATLANTIC

A long-liner of the Latvian fishing fleet based at Liepaja, Western Fisheries Administration, left for waters off Iceland early in May 1968. It was equipped only with a 15-kilometer (9.4 miles) long line fitted with over 20,000 hooks. Under favorable conditions, the vessel was expected to catch as much as 6 metric tons of cod or halibut per haul. Another 4 long-liners from the same port were expected to leave for the North Atlantic. ("Rybnoe Khoziaistvo" Sept. 1968.)

Long Lining Not New

Vessels of the Northern Fisheries Administration have been fishing halibut with long lines in the Barents Sea since 1962. These caught 1,760 metric tons that year and nearly double that (3,240 tons) in 1963. The Soviets have been long-lining commercially for cod and halibut in the North Atlantic also.

Tests Conducted

In 1966, the Kaliningrad commercial fisheries administration sent 3 medium trawlers (SRT-692, SRT-172, and SRT-104) to explore the area between Iceland and Greenland and to test long-lining for cod and halibut. A scientist from the ATLANTNIRO participated in the expedition.

The Soviets expect to expand the use of long-line gear off Norway, Iceland, Greenland, and Canada to increase substantially their catch of cod and halibut. The total Soviet North Atlantic halibut catches have decreased in recent years from 27,100 metric tons in 1964 to 10,300 tons in 1966.

* * *

PREPARES FOR 1968/69 WHALING SEASON

The USSR is preparing for the Antarctic whaling season. Fleets will be sent to Antarctica from Kaliningrad, Odessa, and Vladivostok.

Only 3 whaling motherships will go to the Antarctic: 'Iurii Dolgorukii' from Kaliningrad, 'Sovetskaia Ukraina' from Odessa, and 'Sovetskaia Rossiia' from Vladivostok. Four whaling motherships will be operating in the North Pacific.

International Quota

To prevent further depletion of whale resources, the Soviet Union and other Antarctic whaling countries are restricted to a total catch of 3,200 blue-whale units during the 1968/69 season.

* * *

THE FRESH-WATER CRAYFISH INDUSTRY

Fresh-water fishery landings from the lower reaches of the Volga River had reached 173,000 metric tons by the end of October 1968. Fishing for crayfish on a commercial scale has been a new development on this river and its tributaries. Crayfish are washed, sorted into 3 sizes, and sent live by air to Moscow and other large cities of the USSR. Because of the high temperatures in summer, they must reach market, still alive, within 4 days. A demand for Soviet crayfish has developed in Finland, Norway, and France. ("Fishing News International," Dec. 1968.)

Decrease in Caspian Catches

Data for total fresh-water fishery catches in the Lower Volga for 1967 are not available, so it is not known whether catches in 1968 were larger or smaller than in 1967. It is known, however, that 1967 landings for the

USSR (Contd.):

entire Caspain Sea lagged behind 1963 landings. In 1963, the Soviets caught about 380,000 metric tons in the Caspian. Preliminary data for 1967 show only about 370,000 tons landed.

Crayfish Catches

Crayfish catches in the Lower Volga and the Caspian are small, probably not exceeding 200-300 metric tons a year.

More is known about the crayfish resources in the River Don. In 1967, "Rybnoe Khoziaistvo," a Soviet fishery periodical published an article by V.P. Negrobov stating that "in 1966 the catches of river crayfish in the Rostov Region were only 14% of 1930 catches." The decline was due to overfishing by "unorganized amateurs" who caught twice as many crayfish as the fishery cooperatives (kolkhozes).

Recommendations for Management of the Fishery

Negrobov recommended fishing licenses for amateur fishermen and restrictions as to location, length of time, and type of gear to be used. Negrobov also accused Azovrybvod, the organization responsible for protection and preservation of fishery stocks in the Sea of Azov and nearby reservoirs, of not knowing either the total catches of crayfish in its control area nor the maximum sustainable yield. He noted that, as a result, Azovrybvod can not properly protect the species (the so-called Kuban crayfish) from overexploitation. He suggested an annual catch limit of about 150 metric tons of crayfish for the Don River, its tributaries, and storage lakes. The Kuban crayfish (the word comes from the Caucasian river Kuban) molt and mate at different times every year so the closed season must be newly determined each year.

Negrobov also suggested an expanded transplantation program for various species of crayfish inhabiting the Azov-Caspian Sea basin and modernization of fishing gear and vessels.

* * *

TROUT BRED IN CAGES

In Ropsha, a suburb of Leningrad, the Soviets have begun breeding rainbow trout in cages as chicken and other poultry are bred. Each cage, the size of an average desk, is stocked with close to 2,000 fish. Although the fish are hampered in their movements, this does not impair their appetite or growth. They devour every bit of feed supplied at regular intervals. It is not known how many cages are planned to be set up. ("Rybnoe Khoziaistvo," Oct. 1968.)

HOW MUCH POWER (ENERGY) IS IN A WAVE?

The kinetic energy in waves is tremendous. A 4-foot, 10-second wave striking a coast expends more than 35,000 horsepower per mile of coast.

The power of waves can best be visualized by viewing the damage they cause. On the coast of Scotland, a block of cemented stone weighing 1,350 tons was broken loose and moved by waves. Five years later the replacement pier, weighing 2,600 tons, was carried away. Engineers have measured the force of breakers along this coast of Scotland at 6,000 pounds per square foot.

Off the coast of Oregon, the roof of a lighthouse 91 feet above low water was damaged by a rock weighing 135 pounds.

An attempt has been made to harness the energy of waves along the Algerian coast. Waves are funneled through a V-shaped concrete structure into a reservoir. The water flowing out of the reservoir operates a turbine which generates power. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

ASIA

Japan

SURVEYS SHRIMP RESOURCES IN 5 SOUTHEAST ASIAN COUNTRIES

An 8-man Japanese survey mission studying shrimp resources in 5 southeast Asian countries has found room for further resource development. They noted that it would take a long time to improve the quality of shrimp produced by those countries because of their lack of adequately equipped vessels and cold storages. They also thought undue competition by Japanese trading firms should be eliminated, and saw a need to help build up the local shrimp industries.

Thailand

They found that Thailand, ranking next to Mexico as Japan's leading shrimp supplier, can supply Japan with about 5,000 metric tons annually. However, quality suffers due to the distance over which catches, under inadequate refrigeration, must be transported from port to processing plant. A fishery products exporters association has been formed that could seek quality improvement.

Malaysia

The resource is believed to be abundant in Malaysia, but the government is not actively backing shrimp exports. Processing facilities and refrigeration techniques are still in their early stages of development, although in North Borneo most of the shrimp vessels and processing plants are modern and shrimp quality is good.

Singapore

Singapore does not look promising since it is not a producer of raw shrimp. It imports raw shrimp for processing and reexports it to other countries.

Indonesia

Indonesia's resource is abundant. Quality is poor because shrimp are harvested by fishermen living on many scattered islands where cold-storage facilities are inadequate. It is the most promising country for shrimp resource development. Construction of cold storages and other dockside facilities is the biggest problem.

Philippines

Of the 5 nations, the Philippines is the one most actively striving for shrimp export. It hopes to export shrimp to Japan. Despite resource abundance, fishing vessels and cold storages are few, so there is little hope of obtaining shrimp supply from her in the immediate future. The mission observed that some form of assistance should be extended to develop Philippine shrimp resources. ("Suisan Keizai Shimbun," Dec. 6, 1968.)

* * *

1968 WAS GOOD MACKEREL YEAR

Pacific mackerel fishing off Japan in spring and fall of 1968 was good. Canned mackerel production for both domestic sales and exports was over 10 million cases; it was expected to reach 12 million cases by year's end.

Production of export packs had passed 7 million cases and was expected to total 7.5 million. However, exports were not likely to exceed 6.5 million cases because sales to the Philippines and South Vietnam had slowed down since October 1968. This was due to their delay in setting up letters of credit. Thus, at least 1 million cases of export packs were likely to be carried over to 1969. In 1967, Japan produced 8.06 million cases of canned Pacific mackerel; 4.84 million cases were for export. ("Suisan Tsushin," Nov. 9, and "Kanzume Nippo," Dec. 7, 1968.)

* * *

RECORD HIGH PRICES FOR SEA BREAM AND SQUID

A shortage of 'monko' squid and sea bream taken by Japanese trawlers off West Africa was expected to cause domestic market prices to soar by the end of 1968, when demand peaked. Prices for 'monko' squid averaged US$889-917 a metric ton exvessel in late November; these were expected to advance to a record $1,389 a ton by end of 1968.

Red sea bream, around $611-639 a ton in late November, may have risen to an average of $833 a ton. ("Minato Shimbun," Nov. 22, 1968.)

* * *

Japan (Contd.):

NEW LARGE LONG-LINERS

One of Japan's most modern tuna longliners, the 'Akitsu Maru No. 7,' 450 gross tons, recently built for Kyokuyo Hogei Fishing Co., departed Oct. 28, 1968, for the bluefin tuna fishing grounds south of Australia.

The vessel is equipped with labor-saving equipment, such as the hanging-type fish freezing system, and the line winder, a new long-line retrieving gear similar to the autoreel. It carries a crew of 19, including the skipper; previously, a 300-gross-ton longliner carried 27-28 crewmen.

The vessel is 50.6 meters (166 feet) long, has a beam of 8.9 meters (29 feet), depth of 4.05 meters (13.3 feet), a main engine of 1,250 hp., and maximum speed of 13.1 knots.

Other Vessels

Another large portable-boat-carrying tuna longliner (499 gross tons) was ordered by the Daien Fishing Co. To be named 'Daien Maru No. 11,' she was scheduled to be completed by Miho Shipyard in Shizuoka Prefecture for delivery in January 1969.

A similar-sized longliner, ordered earlier by Daien, was scheduled for delivery in late December 1968. ("Minato Shimbun," Nov. 13, and "Nihon Suisan Shimbun," Nov. 11, 1968.)

* * *

CANNED TUNA SALES DROPPED IN 6-MONTH PERIOD

Canned tuna in brine sold by the Tokyo Canned Tuna Sales Co. to trading firms during April-September 1968 totaled 1,202,849 (standard) cases. This is a decline of about 700,000 cases from the 1967 period, when sales reached 1,901,722 cases.

Tuna in oil validated for export during April-September 1968 totaled 1,162,045 cases, down 271,700 cases from the comparable 1967 exports.

Tuna specialty packs validated for export during the 1968 period were 644,146 cases, up about 130,000 cases over the comparable 1967 figure.

Tuna in brine validated for export to countries other than the U.S. during April-September 1968 totaled 24,648 cases, compared with 11,730 cases for the 1967 period. ("Suisan Tsushin," Nov. 15, 1968.)

* * *

BUYS MORE MEXICAN SHRIMP

In late October 1968, Japanese trading firms negotiating for Mexican west coast shrimp were believed to have contracted for over 1,000 tons of frozen shrimp for November. The new supply was scheduled to arrive in Japan in December.

The Japan Marine Products Importers Association has set a 1,000-ton monthly ceiling for Mexican shrimp imports. When purchases reach that level, the Association cautions trading firms not to make any further contracts during that month.

Quantity buying in November was due to the delayed opening of the Mexican west coast shrimp fishery. The delay caused competition among trading firms for Mexican shrimp for Japan, where holdings of medium and small shrimp had sharply declined during the preceding months. Mexican shrimp suppliers, anticipating the rush, were reported to have raised prices 2 cents a pound for the 26-30, 31-40, and 41-50 counts. ("Suisan Tsushin," Nov. 29, 1968.)

* * *

FROZEN SHRIMP IMPORTS DROP

In Oct. 1968, Japan imported 2,496 metric tons of frozen shrimp worth about US$4.79 million; 3,200 tons were imported in Oct. 1967. The decline was attributed to the total absence of shipments from Persian Gulf countries and from Central American countries other than Mexico. Japanese trading firms were reported hustling to buy shrimp, but were having difficulty in rounding up supplies. Leading suppliers in October 1968 were Hong Kong, Thailand, Pakistan, and Communist China. ("Suisancho Nippo," Nov. 22, 1968.)

SOUTH PACIFIC

Australia

FISH MEAL IMPORTS RISING

In the past 5 years, Australia's fish meal imports have increased more than threefold--from 18.7 million pounds in fiscal year (FY) 1963/64 to 61.7 million pounds in FY 1967/68 (July 1967-June 1968). Imports in FY 1967/68, double the previous year's, equaled about 300 million pounds of fish, round weight; this was 3 times the total annual fish catch.

Australia imported 30,869 short tons of fish meal in FY 1967/68. South Africa supplied 20,608 short tons; Chile, 8,128; American Samoa, 1,042; Peru, 718; and other countries, 373. Average import value dropped from A$139 a short ton in 1966/67 to A$104 in 1967/68 (A$1 = US$1.12).

Fish Meal Production Steady

Fish meal production was the same in 1967/68 as in 1966/67--2.2 million pounds.

Rapidly growing imports and rising interest in establishment of reduction plants reflect the increased emphasis on scientific livestock feeding methods, particularly for poultry and pigs. ("Australian Fisheries Newsletter.")

* * *

FOREIGN VESSELS IN AUSTRALIA'S 12-MILE ZONE

At least 3 times in 1968, Taiwanese fishing vessels, allegedly fishing or transiting inside Australia's 12-mile territorial seas, created a minor public furor, particularly in Queensland. In the latest incident, in Oct. 1968, 5 vessels were sighted in the general vicinity of Portland Roads, 250 miles north of Cooktown, Queensland.

One Australian trawler reported that crew members of a Taiwanese vessel went ashore on October 31 without the Australian Government's authorization, apparently in search of fresh water.

Public Concern

Continued sightings of Soviet, South Korean, and Taiwanese vessels fishing off Australian coasts have spurred public and industry interest in government action to ensure that such vessels fish only in international waters. While patrol craft are sent to investigate reports of foreign vessels in the 12-mile limit, many commentators believe that Australia's capability is too limited to allow for adequate patrol of offshore waters.

American Samoa

NEW TUNA PRICES

Japanese tuna suppliers and U.S. packers in American Samoa agreed on December 1968 and January 1969 prices. Albacore increased $20 a ton and yellowfin $5 a ton in December 1968. There was to be an additional $5 a ton increase for all January 1969 deliveries.

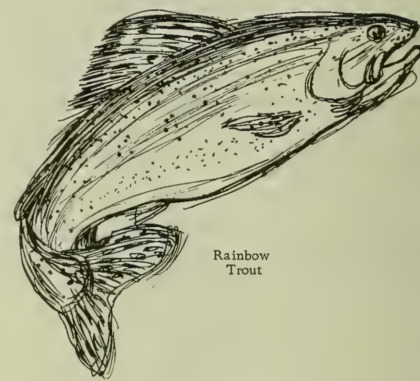
December prices, per short ton: round albacore--frozen, $410; iced, $395; g. & g. yellowfin--frozen, $335; iced, $312.50. ("Suisan Keizai Shimbun," Dec. 6, 1968.)

INDEX

TROPHY TROUT

Coals from last summer's campfire have cooled. Ashes have scattered. Trout caught from cold waters and pan-fried beside the stream are only a memory.

Stir the coals back to life with this outdoorsy method of frying trout. Whether you take one of last summer's catch from the freezer or cast into your supermarket fish department, you will hook a trophy meal of bragging-size taste with trout marinated in a buttermilk-onion soup mixture and then fried.



Rainbow Trout

You won't need an expensive fishing pole or an expensive taste to angle trout onto your menu. Trout are now available to any home campfire in freezer convenience. In addition to being high in nutritive value, they are firm, easy to handle, and easy to prepare.

Apply this recipe to trout, and you will get the same mealtime enjoyment from young and old, fisherman and non-fisherman. Only their thoughts will be different--the romantic adventure of a mountain trip that wafts through the memories of a fashion-conscious fly caster; the button-popping proudness of a young pole-and-stringer; the quiet pleasure of a grizzled veteran as he caps another successful fishing trip with a tasty trout dinner; and the shared pleasure by all table guests of a filling, tasty meal.

Not to be outdone by the fishermen in her family, the homemaker can match any angler, creel for creel, by wisely baiting her menus with this finny delicacy.

TROPHY TROUT

3 pounds pan-dressed rainbow trout or other pan-dressed fish, fresh or frozen	1 cup flour
1 cup buttermilk	Lemon wedges
1 package ($1\frac{3}{4}$ or $1\frac{3}{8}$ ounces) onion soup mix	Fat for frying

Thaw frozen fish. Clean, wash, and dry fish. Place in a single layer in a shallow baking dish. Combine buttermilk and soup mix. Brush fish inside and out with sauce. Let stand 1 hour. Remove fish from sauce and roll in flour. Fry fish in hot fat at moderate heat for 4 to 5 minutes or until brown. Turn carefully and fry 4 to 5 minutes longer or until brown and fish flakes easily when tested with a fork. Drain on absorbent paper. Serve with lemon wedges. Makes 6 serving.

The latest methods for purchasing, handling, storing, and preparing fish are included in the new, 60-page, complete guide to fish cookery, "Let's Cook Fish." This valuable, full-color reference and recipe book is available by sending 60¢ to the Superintendent of Documents, Washington, D. C. 20240.

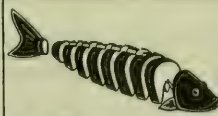
MARKET FORMS OF FISH

Fresh and frozen fish may be bought in a variety of cuts, the more important of which are shown here. Knowing the cuts and their particular uses is important in buying or selling fish. The edible portion varies with the type of cut, from 100 percent for fillets to about 45 percent for whole fish

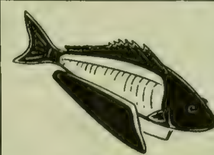
Whole or round fish are those marketed just as they come from the water. In this form, the edible portion is about 45 percent of the whole, but varies with size and kind of fish. To prepare for cooking, fish should be scaled and eviscerated and, if desired, head, tail, and fins should be removed. Fish then may be used for baking, or may be sliced, filleted, or cut into steaks or chunks. Small fish, like smelt, are often cooked with only the entrails removed.

Drawn fish are those marketed with only the entrails removed. In this form, the edible portion is about 48 percent, but varies with size and kind of fish. To prepare for cooking, they are generally scaled. Head, tail, and fins may be removed, if desired, and the fish split, filleted, or cut into steaks or chunks.

Dressed fish are scaled and eviscerated, usually with the head, tail, and fins removed. Edible portion in this form is about 67 percent, but varies with size and kind of fish. The smaller sizes are ready for cooking as purchased (pan dressed). The larger sizes may be baked as purchased or may be cut into fillets, steaks, or chunks.



Steaks are cross-section slices of the larger sizes of dressed fish, usually about ¾ of an inch thick. In this form the edible portion is about 84 percent. Steaks are ready to cook as purchased.



Fillets are the sides of fish cut away from the backbone. They are practically boneless and have little or no waste. Fillets are ready for cooking. The skin may be left on or may be removed. A fillet cut from one side of a fish is called a single fillet. This is the type most generally seen in the market.

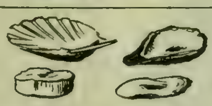
Butterfly fillets are the two sides of the fish corresponding to two single fillets held together by the uncut flesh and skin of the belly.

Sticks are pieces of fish cut lengthwise or crosswise from fillets into portions of uniform width and length, usually about 1 inch wide and 3 inches long.

MARKET FORMS OF SHELLFISH

Some shellfish are marketed alive. Other market forms, depending on the variety, include cooked whole in the shell, fresh meat (shucked), headless, and cooked meat.

In shell: Shellfish, such as hard and soft blue crabs, lobsters, clams, and oysters should be alive if bought fresh in the shell. Crabs and lobsters may also be cooked in the shell. Edible portion varies widely.



Shucked: Clam, oyster, and scallop meats may be bought free of the shell, commonly known as shucked. In this form the portion is 100 percent edible.

Headless: Only the tail part of shrimp is commonly marketed. Spiny-lobster tails are also a common market form. About 85 percent is edible.

Cooked meat: The edible portion is picked from the cooked shellfish. Crab, shrimp, and lobster meat is marketed in this way. Cooked meat is perishable, although packaged in containers, since it is not further processed by heat. It is 100 percent edible.

--<u>Fresh and Frozen Fish Buying Manual</u>, Circular 20, Fish and Wildlife Service.

SPINY LOBSTER GEAR AND FISHING METHODS

Fishery Leaflet 487, Spiny Lobster Gear and Fishing Methods describes the gear and methods known and used specifically in the Florida area. Modified versions may be found in other areas since the spiny lobsters' range includes the tropical, subtropical, and some temperate seas of the world. At present, commercial spiny lobster fishing is practiced in Florida, throughout the Caribbean, Central America, South America, Mexico, South Australia, Korea, and other countries of the Far East. Several closely-related species are involved.

To catch the spiny lobster *Panulirus argus*, Florida fishermen have effectively used several types of gear and fishing methods. Although some of these are now illegal in Florida, they may be permitted in other areas where fishing regulations differ.

Certain factors of spiny lobster biology bear directly on the gear and methods used to catch them. They are taken mainly in waters less than 50 feet deep, although they are known to occur in greater depths. Biologists have studied spiny lobster migrations and have found that they move between inshore and offshore waters as well as along shore during various periods of their life cycles. A knowledge of these movements, as they relate to seasonal, weather, and water conditions of an area, is used by fishermen in planning their operations.

There is little standardization in spiny lobster boat design. Boats used range from 14-foot skiffs, which are rowed or are outboard-engine powered, to motor launches.

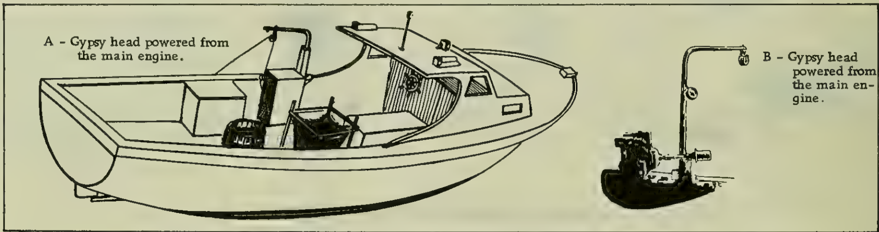


Fig. 1 - A typical spiny lobster motor launch.

The typical commercial launch is wooden hulled, of shallow draft, 26 to 36 feet long, and is powered by an engine of 125 to 150 hp. Diesel engines, marine gasoline engines, and converted automobile engines are used. The Diesel's cheaper maintenance and fuel costs make it the preferred engine, but its higher purchase cost prevents most boat owners from installing it. For this reason marine gasoline engines and converted automobile engines are much more commonly used.

The most popular commercial gear is the wooden lath trap. Florida law limits its maximum dimensions to 3 by 2 feet. Some fishermen build traps to this size; others reduce all dimensions but retain the rectangular shape. Still others reduce top dimensions only, thus forming a flat-topped pyramid (fig. 2).

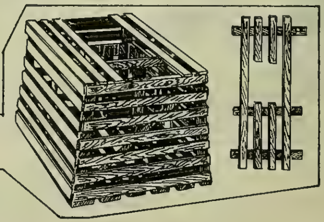


Fig. 2 - Pyramid-type wooden lath trap with removable lid.

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

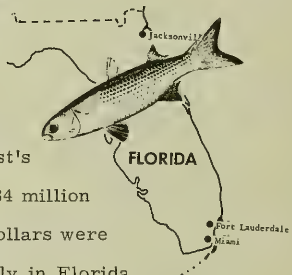
The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

"MULLET COUNTRY"



The mullet--a long-time favorite of commercial fishermen on the Gulf coast--is gaining recognition as one of the Southeast's more rapidly developing species. Over 34 million pounds of mullet valued at 2.3 million dollars were harvested in 1967. Although caught mostly in Florida, this species abounds along the U.S. seacoast from North Carolina to Texas.

A 14-minute, 16mm. sound, color film about this advancing fishery has been produced by the Bureau of Commercial Fisheries in cooperation with the Florida Board of Conservation. The film, "Mullet Country," traces the history of the species back to the Egyptian, and follows its present distribution channels from fishing vessel to consumer's table. "Mullet Country" received a silver award at the 1968 International Film and Television Festival held in New York City.

A catalog of 26 fishery motion pictures, including "Mullet Country," is available, free of charge, from Audio-Visual Services, Bureau of Commercial Fisheries, 1815 North Fort Myer Drive, Room 601, Arlington, Virginia 22209.

COMMERCIAL FISHERIES *Review*

VOL. 31, NO. 3 MARCH 1969

COVER: Indian fisherman holds hammerhead shark (left) and ray. (FAO/ T. S. Satyan)

COMMERCIAL FISHERIES
Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

Fishermen's Memorial
Gloucester, Mass.

The Bureau of Commercial Fisheries and The Bureau of Sport Fisheries and Wildlife make up The Fish and Wildlife Service of The United States Department of the Interior.

Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

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CONTENTS

A 14-tooth 'Fall River' clam dredge rigged with an accumulator-chain modification--used for exploratory fishing by R/V 'Silver Bay' off North Carolina. (Photo: J. B. Rivers)

U.S. FISH CONSUMPTION IN 1968 WAS HIGHEST SINCE 1954

The average American ate more fishery products in 1968 than he had in any of the preceding 14 years. The per-capita consumption figure was 11.1 pounds, edible weight--0.4 of a pound more than the 10.7 of 1967. Retail prices averaged 2% more.

The rise in fish consumption heartened some industry observers who had waited impatiently for the first hard evidence with which to measure the impact of the ending of "meatless Friday" by the Catholic Church in early 1967.

How 11.1 Was Divided

Of the 11.1 pounds, fresh and frozen fishery products totaled 6.2 pounds, a rise in this category over 1967. Most of the increase was in fresh fillets and frozen fish sticks and portions. U.S. production declined for haddock, halibut, ocean perch, tuna, king crab, and blue crab.

Canned fishery products were an estimated 4.4 pounds per capita, a slight increase over 1967. There were large increases in the canned packs of salmon, Maine sardines, and California mackerel--and slight increases in shrimp, oysters, and anchovies. Imports of canned products rose slightly.

Completing the 11.1 pounds was one-half pound of cured fishery products, virtually unchanged from previous years.

Over 2 Billion Pounds

The use of fresh and frozen fish and shellfish was estimated at 1,224 million pounds--about 66 million pounds greater than in 1967.

Use of canned seafood was estimated at 870 million pounds--30 million pounds higher than in 1967.

U.S. Position Has Changed

In less than 20 years, the U.S. has changed from an overall domestic producer to a net importer of fishery products. The U.S. is the world's largest importer and may have the largest market for aquatic products.

In 1968, U.S. fishermen could produce only 40% of the Nation's needed supply of edible fishery products--and about 15% of its needs for industrial fishery products.

More U.S. Supplies in Future

In the future, more supplies of fishery products are expected to come from still-undeveloped U.S. fisheries: a scallop fishery off the South Atlantic Coast and another off Alaska--and shrimp resources off the Pacific Northwest and New England.

UNITED STATES

Forecast Abundance of Groundfish & Sea Scallop on New England Banks

The abundance of groundfish and sea scallops fished by New England fishermen has been forecast by BCF's North Atlantic Region. The forecast is based on information provided by biologists of BCF's Woods Hole Laboratory. They monitor landings of commercial fishermen and study populations of fish and shellfish on offshore banks by sampling from the 'Albatross IV.'

Haddock landings in New England dropped from 98 million pounds in 1967 to 71 million pounds in 1968. There were fewer fish, primarily on Georges Bank. Natural causes and heavy fishing by foreign fleets in 1965 and 1966 were to blame. Recovery of these depleted stocks is not expected within the next two years.

The annual fall groundfish survey of the Albatross IV revealed a very poor 1968 year-class of haddock, the fifth consecutive one. (The last good year-class was in 1963.) As a result, abundance will continue to decrease during 1969 and 1970 because Georges Bank haddock do not reach marketable size before they are two. On Browns Bank, where the 1963 year-class has been important during the last few years, haddock abundance is expected to decrease. There has been no strong year-class there since 1963.

Cod

Cod landings in New England in 1968 were 48 million pounds, 4 million pounds above 1967. Georges Bank cod abundance was slightly higher in 1968 than in 1967. The Albatross IV groundfish survey indicates an increase in young-of-the-year cod, as in 1967. So a slight increase in abundance is expected for 1969.

Whiting

Whiting landings for food increased from 60 million pounds in 1967 to 72 million in 1968. Abundance increased slightly over 1967. Abundance on Georges Bank was somewhat lower, but increased considerably in Gulf of Mexico. Higher landings in 1968 resulted from increased fishing in Gulf of Maine. Whiting abundance probably will not change markedly in 1969.

Yellowtail Flounder

Yellowtail flounder landings in 1968 were 65 million pounds, 13 million above 1967. This increase resulted from greater abundance due to relatively strong 1964 and 1965 year-classes. Later year-classes are not quite as large, and 1969 abundance is expected to be the same or slightly lower than in 1968.

Ocean Perch

Ocean perch (redfish) landings were 63 million pounds in 1968, compared to 71 million pounds in 1967. Although abundance increased on all ocean-perch grounds during year, low fishing effort resulted in the catch decrease. The 1969 landings will depend largely on market demand.

Industrial Fish

Industrial red hake and whiting catches from southern New England grounds were 22 million pounds in 1968 and 20 million in 1967. Abundance in 1968 was somewhat higher than 1967; abundance in 1969 is expected to be the same or slightly higher than 1968.

Total southern New England industrial fish landings (all species) by otter trawl were 76 million pounds--2 million lower than 1967. This was due to decreased fishing effort because abundance of industrial fish species increased slightly in 1968. This abundance level is expected to continue through 1969.

Sea Scallops

Sea-scallop landings were 9 million pounds of meats in 1968, 8 million in 1967. Of the 9 million, 2 million were from Georges Bank, and 7 million from Middle Atlantic grounds.

Georges Bank landings in 1968 were about the same as in 1967, while Middle Atlantic landings were up 1 million pounds. Abundance of sea scallops on Georges Bank decreased in 1968; a further decrease is expected during 1969.

Sealskin Harvest

The 1968 harvest of Pribilof fur sealskins was shipped by rail to the processor during January 1969. The U.S. share of the harvest was 40,970 skins (533 barrels), and the Japanese Government's share was 8,781 skins (116 barrels). Total blubber production was 476 barrels, consisting of 6 barrels for the Canadian Government, 28 barrels for Japan, 130 barrels to be used in processing the U.S. skins, and 312 barrels bought by the Fouke Company.

5 of 6 U.S. Fishing Vessels Have Electronic Equipment

In 1967, there were 11,021 fishing vessels in the U.S. 5 gross tons and over, according to the Bureau of Customs. Five of 6--9,403 vessels--had some electronic gear. Loran, a long-range, radio direction finder, was aboard 2,767 vessels. The rest had less sophisticated, but useful, navigational equipment.

Ferro Cement Fishing Boats Are Being Built

Two cement fishing vessels are under construction at the Marine View Boat Building Co. in Tacoma, Wash. A 32-foot troller was recently launched. Under construction, upside down, is a 50-foot combination fishing vessel for a Sitka, Alaska, fisherman.

These are the first ferro cement fishing craft to be built in the Pacific Northwest. Because of low cost and speed of construction, this may set a trend in fishing-vessel construction. The hull is formed of 1-inch thick cement reinforced with steel webbing. This material has another advantage: there is virtually no maintenance cost because cement is free of rust and impervious to destructive marine organisms.

Groundfish Fillet Import Tariff-Rate Quota Set for 1969

The reduced-tariff-rate import quota on fresh and frozen groundfish (cod, haddock, hake, pollock, cusk, and ocean perch) fillets and steaks for 1969 is 26,465,631 pounds. This was announced by Bureau of Customs in the Feb. 15, 1969, "Federal Register." Divided into quarterly quotas, this means that 6,116,407 pounds of groundfish fillets and steaks may be imported at the $1\frac{7}{8}$ cents-per-pound rate of duty, and any imports over the quarterly quota will be dutiable at the rate of $2\frac{1}{2}$ cents a pound.

Reduced-Tariff-Rate Import Quota for Fresh and Frozen Groundfish Fillets, 1955-1969

Year	Quota	Year	Quota
	1,000 Lbs.		1,000 Lbs.
1969	26,466	1961	32,601
1968	24,895	1960	36,533
1967	24,883	1959	36,920
1966	23,591	1958	35,892
1965	24,384	1957	37,376
1964	24,862	1956	35,197
1963	24,875	1955	35,433
1962	28,571		

Quota Higher Than 1968's

The reduced-rate import quota for 1969 is up from the 1968 quota of 24,894,900 pounds. From 1951 to 1960, the quantity of fresh and frozen groundfish fillets permitted to enter the U.S. at the reduced rate of duty of $1\frac{7}{8}$ cents a pound had increased 24.7 percent. In 1961, however, the trend was reversed significantly for the first time. This occurred because in 1960 frozen fish fillet blocks with bits and pieces were no longer dutiable under the Tariff category of "frozen groundfish fillets."

Kennedy Round

U.S. concessions granted in the 1964-67 trade conference (Kennedy Round) at Geneva reduced the rate of duty on fish blocks (with bits and pieces) from 1 cent a pound to 0.8 cent a pound on Jan. 1, 1968, and 0.5 cent a pound on Jan. 1, 1969. Concessions on fish blocks are being put into effect in 5 annual stages; the final reduction will become effective Jan. 1, 1972, when fish blocks will be made duty free.

Crab and Shrimp Pasteurization Lengthens Their Storage Life

The report of an EDA-financed study shows that pasteurization can extend the low-temperature storage life of Dungeness crab and shrimp. The study was conducted at the Seafood Research Laboratory, University of California San Francisco Medical Center.

The Findings

The researchers found that shrimp and crab meat can be pasteurized in boilable plastic pouches at 82.2° C. (180° F.) for 5 minutes (center temperature). This extends by about 50 days the storage life at 1.1 to 4.4° C. (34 to 40° F.).

The incidence of potential pathogens on commercial shrimp and crab meat is low--but these bacteria were able to grow. In some cases, these bacteria produce toxin over a relatively wide temperature range. While no Cl. botulinum was found in the 128 samples tested, the probability of this organism surviving the pasteurization process still exists.

The researchers conclude that pasteurization of shrimp and crab meat is a feasible and potentially useful procedure. But, for safety sake, the pasteurized products should not be stored at temperatures above 2.2° C. (36° F.).

Southeastern Fisheries Association Meets June 13

The Southeastern Fisheries Association and its subsidiary, the Florida Shrimp Assoc., will hold their 17th Annual Convention in Tampa, Florida, at the Manger Motor Inn, June 13-16, 1969.

A boat and equipment show is planned. Members and guests will be able to visit BCF's 'Oregon II', scheduled to tie up at the Inn for a day or two.

EDA Funds Help Sea Industries Study

The Commerce Department's Economic Development Administration (EDA) has made available $143,220 to help determine the feasibility of cultivating oysters, fish, and fishing worms on the Lummi Indian Reservation in Washington. The study will demonstrate whether scientific production of the three sea products in the 5,000-acre estuary bordering the reservation can become a stable source of income for the tribe.

The resources of fish and shellfish in nearby waters--Bellingham Bay, the Strait of Georgia, Hale Passage, and the Nooksack River--are the only potential source of income. The tribe says the reservation lands are unsuitable for farming, and industrial jobs developed in the area recently have not benefited its members.

650 Jobs Possible

The tribe expects about 650 jobs to result in worm, oyster, and fish culture. Additional jobs would be created in processing, distributing, and marketing the products.

Scientific research on methods of production and environmental factors will be conducted in Federal and State cooperating laboratories and the Lummi Island Laboratory. The latter is sponsored by Western Washington State College of Bellingham. Indian trainees will aid in the research. In addition to EDA funds, the applicant, Lummi Business Council, is providing $288,000 from other sources. The Bureaus of Commercial Fisheries and Sport Fisheries and Wildlife will furnish some equipment, fish egg stocks, facilities, and technical advice for the study.

Lobster Tagging Produces Interesting Information

The lobster research program of BCF's biological laboratory at Boothbay Harbor, Maine, is paying off. In 1968, 2,634 lobsters were tagged and released offshore in the Gulf of Maine; 76, 2.9%, have been recaptured.

Of the 66 fully documented recaptures, 29% had migrated less than 10 nautical miles, 45%

between 10 and 50 miles, and 26% over 50 miles. The lobsters moved both north-south and east-west.

Released In 80 Fathoms

The tagged lobsters were released in an average of 80 fathoms. From April-November 1968, the lobsters recaptured were in an average of 57 fathoms; from November 1968-mid-February 1969, the average was 153 fathoms. These data support hypothesis that offshore lobsters move into shoal water during spring and summer--and return to deep water in fall and winter.

Molting and Growth

Thirteen of the lobsters returned to the lab had molted. Growth increments ranged from 12.4% to 20%; the average was 16.7%. Average growth increment for 'inshore' lobsters is 12-13%.

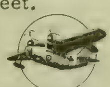
Thread Herring Schools Detected at Night

Schools of thread herring have been detected at night in the Gulf of Mexico by BCF's Pascagoula (Miss.) Exploratory Fishing and Gear Research Base. During test flights in January 1969, aboard U.S. Coast Guard aircraft, base personnel detected more than 80 large schools.

The Equipment

The night-vision equipment consists of an image intensifier developed by the Army, closed-circuit TV, and a video-taped system.

The image intensifier can amplify available light 55,000 times. It can be used to locate fish schools at night from altitudes of at least 5,000 feet.



Drift Bottle Found After 7 Years

A sealed beer bottle that was set adrift in the Pacific in 1961 by BCF's Biological Laboratory in Honolulu, Hawaii, has come ashore after more than 7 years and 10,000 miles in the ocean. The bottle was recovered at Cannon Beach, Oregon, in January 1969. It had traveled a straight-line distance of 3,090 miles. A BCF oceanographer, however, estimated the actual distance as 10,000 to 12,000 miles.

The Honolulu lab also has used cards in plastic to study surface currents of the central Pacific.

Fishermen Shown How to Construct Trawl Economically

An expert from BCF's Seattle (Wash.) Exploratory Fishing and Gear Research Base, Jerry Jurkovich, recently lectured and demonstrated to fishermen the most economical method of cutting and tapering webbing in the construction of trawls. The project was organized in cooperation with the Oregon State University's Extension Service.

This was the Seattle Base's first effort in its Aid-to-Industry Program to talk to groups of fishermen on more efficient methods of fishing and gear construction. The response was considered excellent: 40-45 fishermen attended at Astoria, 20 at Newport, and 20 at Coos Bay.

BCF Scientist Honored by Wildlife Society

Dr. Stanford H. Smith, a Senior Fishery Research Biologist in BCF's Biological Laboratory at Ann Arbor, Michigan, received the annual Fisheries Publication Award of The Wildlife Society in Washington, D. C., on March 3.

He was honored for his paper, "Species Succession and Fishery Exploitation in the Great Lakes," which appeared in the "Journal Fisheries Research Board of Canada," in 1968.

BCF Scientists Assess Effect of Oil Spillage in Santa Barbara Channel

On Jan. 30, 1969, Union Oil Alpha Drilling Tower, located 3 miles offshore from Santa Barbara, Calif., began leaking crude oil at a rate of about 20,000 gallons per day. The leak continued, on and off, to the end of February, when this report was written, despite all efforts to halt it. A total spillage of perhaps 5,000,000 gallons was spread over the Santa Barbara Channel, including 30-40 miles of coastline, and the offshore island of Anacapa.

The most obvious biological effects of the spillage were on the nearshore fauna of the kelp beds, the intertidal zone (where State and university ecologists were actively working), and on marine birds and mammals. BCF-La Jolla decided that a short cruise of its 'David Starr Jordan' would be mounted by staff of the Fishery-Oceanography Center to investigate effects on the offshore pelagic ecosystem, primarily to determine if reduced viability of fish eggs and larvae could be detected.

(Photo: George Mattson)

Investigation Plan

The scientists hoped to detect the effects of oil pollution on pelagic fish eggs and larvae in two ways: 1) By a direct and rapid series of observations of unpreserved material taken from plankton hauls in water covered, or recently covered, with floating oil, oil-detergent mixtures, or both; the viability of the material would be compared with plankton samples taken as controls outside the oiled areas. 2) By comparing the viability, specific and age composition of pelagic eggs and larvae from samples taken under oil with data from a long-time series available for nearby CalCOFI station no. 83.40.

It was also hoped to observe effects of oil cover on: phytoplankton and microzooplankton; near-surface oxygen and nutrients; and light transmittance. Part of these objectives were to be the responsibility of ecologists from Scripps Institution of Oceanography, who participated in the cruise with Bureau scientists led by Dr. Paul Smith.

Jordan In Action

Jordan was in the polluted area on Feb. 11, 1969. The scientists first made a visual reconnaissance at Alpha Tower of light transmittance. Beneath primary slicks of brown crude oil, before they had aggregated to tar or spread to the iridescent form, ambient light at about 2 m. below the oil was only 0.3. This was 10% of what it was at the same depth below clean water just outside the slick, so light absorption by floating crude oil appears to be extremely high. This is an important factor to remember in phytoplankton ecology where such cover remains in situ for long periods (Fig. 1).

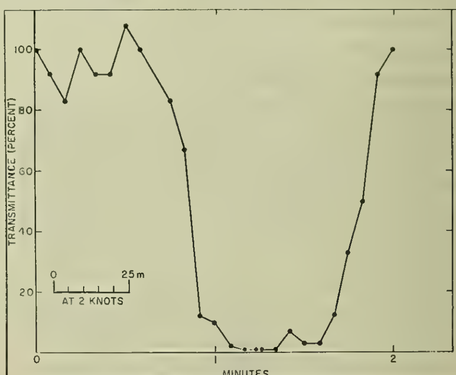


Fig. 1 - Light transmission under crude oil.

Pump samples of phyto- and microzooplankton were taken by Andrew Soutar of Scripps Institution. He reports that phytoplankton counts were significantly lower than at a nearby station in January. The present low values were repeated at a series of pump stations taken right across the Santa Barbara Channel.

Analysis of near-surface nutrients of water taken from under the oil slick (nitrite, nitrate, silicate, and phosphate) showed no

apparent differences when compared to samples taken from nearby clear water. Dissolved oxygen readings, however, were significantly lower under the heavy oil slick than in clear water. The importance of this difference may be as an indicator of a trend--rather than having immediate physiological importance to marine organisms.

A series of 6 standardized zooplankton tows were taken in polluted locations. The oil was cleared by a fire pump in order to lower and retrieve the nets. A control series was taken in clean water.

Findings

Examination of the eggs and larvae of fish sorted from the samples from polluted water indicated (1) no gross evidence of dead or deformed larvae or eggs, and (2) no gross departure from the expected specific composition of the ichthyoplankton at CalCOFI station 83.40.

At this station, the long-term (> 10 years) ratio of anchovy eggs: anchovy larvae is 1: 0.65, while this ratio in the 6 polluted samples was 1: 0.78. This indicated no apparent increase in mortality over normal.

The oil leak began on January 30 and more than 2% of all larvae in the polluted series of samples were spawned before that time. This is a normal percentage of older larvae (> 7 mm.) for unpolluted samples.

In addition to anchovy larvae, there were 33 hake larvae (Merluccius productus) between 2.0 and 5.5 mm, 46 Sebastodes spp. (rockfish) larvae between 4.0 and 5.5 mm; 659 Cynoscion sp. larvae (a sciaenid); 9 Citharichthys spp. larvae (a sand dab); 9 Parophrys sp. larvae (English sole); 7 Leuroglossus sp. (deep-sea smelt); and 1 Pleuronichthys sp. larva (a flounder). These are the expected species in about the expected numbers for samples in this area.

Investigation to Continue

In assessing these results, it must be remembered that oil slicks move downwind much faster than the water some meters below the surface in which most eggs and larvae occur. Further, there are considerable tidal and other currents in the area. Because a larva some days old is taken below floating crude oil does not necessarily mean that it has been there very long. It is extremely difficult to measure pollution effects (except perhaps for neuston) under such circumstances.

Monitoring the wider effects on pelagic eggs and larvae by the present year's CalCOFI survey will continue. Jordan will be sent through the area again in the course of routine survey. We are confident that if the Santa Barbara leakage continues, and if it produces a significant effect upon spawning and viability of pelagic species, this effect will be detected in the present year's sampling program.

Chemical Dispersant Used

A chemical dispersant, said to be nontoxic to marine life (COREXIT 7664) was used widely in the area around the leaking oil well but only slightly in the near-shore area. A sample was obtained from the manufacturers. Its toxicity was tested in a preliminary manner by Dr. Lasker.

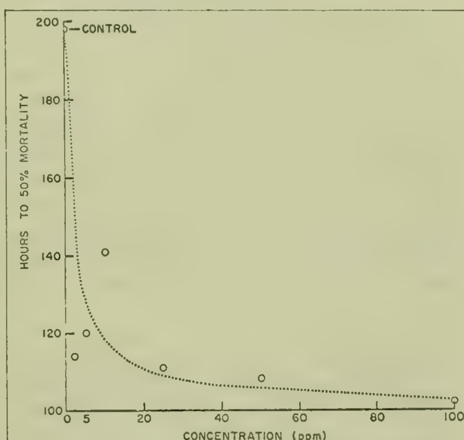


Fig. 2 - The effect of the dispersant COREXIT on Engraulis mordax (northern anchovy) eggs & larvae.

Samples, each of 50 late-development anchovy eggs, used for bioassay indicates toxicity, as measured by time to 50% mortality, at all levels of dilution in natural sea water which were tested. Concentrations of only 2 ppm. COREXIT 7664 reduced the 50% mortality time of eggs and larvae to 57% of the control, while the higher concentrations were only slightly more detrimental (see Fig. 2).

California Vessel Longlines Broadbill Swordfish

M/V 'Blue Belle' returned to San Diego, Calif., on Feb. 8, 1969, with the first load of longline-caught broadbill swordfish by a California commercial vessel. She fished a total of 4,200 hooks and caught 33 swordfish (average 0.8 fish per 100 hooks). Total dressed weight of the landed fish was about 2.5 tons. Each of 10 sets produced at least 1 swordfish; the two best catches were 9 fish on 392 hooks and 8 fish on 336 hooks. The swordfish ranged in fork length from 91 to 277 cm. (20 to 360 lbs., dressed). Gonads collected from 29 fish showed that 27 were females, none in advanced stage of development.

The catch also included several dolphinfish, one striped marlin, and about 1,500 sharks, most were blue sharks. In addition, 2 tons of yellowfin and skipjack tuna were taken on trolling gear.

The vessel worked near Uncle Sam Bank (Lat. 25° 35' N.; Long. 113° 30' W.). The water temperature ranged from 19.2 to 21.4° C. BT casts taken before each set revealed sharp thermoclines starting at 43 to 72 m.

The longline gear and methods worked satisfactorily. Four men were able to conduct the operations efficiently. Because of many sharks encountered, however, the crew found it difficult to set more than 400 hooks. The sharks caused extensive snarling of the mainline and often cut it. Much time was spent replacing cut leaders and unsnarling the line.

Second Trip Scheduled

The results of the trip were sufficiently promising to warrant a second trip. Blue Belle was planning to fish again in March. A second vessel, 'Ron H.' out of Morro Bay, will also enter the fishery. Both will use BCF-designed gear and methods. The experience gained will increase knowledge of distribution and life history of the swordfish and lead to establishment of a profitable fishery.

Juvenile Tropical Fish Raised in Lab

For the first time, eggs and larvae of important tropical fishes from the western Atlantic Ocean have been raised to juvenile size in the laboratory, reports the University of Miami's Institute of Marine Sciences.

Charles A. Mayo, a graduate student, succeeded in rearing 13 species of fishes, representing 12 fish families, from egg to juvenile. The fishes are herring, anchovy, sea trout, flounder, flyingfish, pigfish, grunt, sea robin, pinfish, spadefish, goby, dragonet, and trunkfish. All form important links in the sea's ecologic balance.

Dr. F. G. Walton Smith, Institute Director, stated: "This well-established success in rearing many species of young tropical Atlantic fishes is unprecedented. Furthermore, the techniques developed and proved successful by the Institute can be used for rearing species most often sought by commercial and game fishermen, including tuna, sailfish, marlin, dolphin, and king mackerel, and this is one of the goals of our study."

Mayo's Work

Mayo collects eggs for his fish nursery by towing a plankton net far out in the Gulf Stream, and from the Institute's dock in Bear Cut. Once the eggs have hatched in laboratory tanks, the larval fishes feed on zooplankton. To provide an abundant supply of food, Mayo has created an 'in-the-laboratory food chain.' Zooplankton feed the fish larvae, and the zooplankton is fed phytoplankton maintained on organic and inorganic nutrients added to the tanks.

The development of eggs and larval fishes is watched closely by Mayo. He records observations, takes photos, and preserves individual specimens. Many fishes are difficult to identify until long after they have hatched, states the Institute. Data from this study provide information on the "functional structure, behavior, and growth of fishes in their early stages of development."

Young Indians Tour BCF's Miami Lab

Forty young American Indians traveled from their ancestral camp in the Florida Everglades to the scientific environment of a modern marine research laboratory on March 14. They visited BCF's Tropical Atlantic Biological Laboratory (TABL). All were students at the new Miccousukee Day School on the Tamiami Trail at Forty Mile Bend, Florida. The Miccousukee people were settled in Florida long before the white man came. They are not related to the better known Seminole Tribe.

A Full Day

The 10- to 17-year old students were accompanied by an interpreter (they speak little English) and by Robert Pinard, Director of Student Activities. They saw a film on marine life and the ecology of the oceans. They toured the lab and later visited the Miami Seaquarium as guests of the management.

Later, they toured the TABL research vessel 'Undaunted' and TABL staff explained some procedures followed on marine scientific cruises.

Marine Science Job Opportunities

The theme emphasized throughout the visit was that marine science could lead to rewarding careers for nature-oriented American Indian youths. They were told about the many jobs in the expanding field for trainees, ships' crew members, technicians, and scientists, particularly in Florida. Laboratory and school officials hoped to encourage in the young Miccousukee "an awareness of the natural affinity between their innate understanding of the wilderness and the doctrines of the marine scientist, and perhaps to stimulate an ambition to study subjects that will equip them for careers in marine science."

IF ALL THE ICE IN THE WORLD SHOULD MELT, WHAT WOULD HAPPEN?

The possibility that all the ice in the world would melt is extremely remote. If it should happen, the time span would be measured in thousands of years and the increased weight of the water would probably cause the ocean basins to sink and the land masses to rise.

In the unlikely event that all the world's ice would suddenly melt, the sea level all over the world could rise as much as 500 to 600 feet. The Antarctic ice cap alone covers 6 million square miles and, if melted, would yield about 6.5 million cubic miles of water, enough to feed the Mississippi for more than 50,000 years.

A rise of even 100 feet would flood most of the Atlantic seaboard of the United States, including all the major cities. A rise of 600 feet would cause the seas to cover 85 or 90 percent of the earth's surface (the oceans now cover about 71 percent of the earth's surface). The United States would be split in two by the "Mississippi Sea" which would join the Gulf of Mexico with the Great Lakes.

On the basis of evidence gathered from all over the world, Dr. Rhodes Fairbridge of Columbia University concludes that some 6,000 years ago the oceans rose about 14 meters within a few centuries, flooding almost all the areas where man had begun to found civilizations. He believes this to be the same Great Flood described in the Bible, in Buddhist records, and in legends handed down in many lands.

There is also the possibility that the ice age is not yet over and that the ice caps may again increase in size. If another glacial advance comparable to the last one should occur, many of the important manufacturing and agricultural areas of the world would be covered, forcing widespread migrations. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

Fishery Legislation Proposed in Congress

The bills introduced recently into both Houses of the 91st Congress show that members are concerned about quality and the need for sanitation controls over fish and fish products.

On Feb. 19, Sen. Hart, Mich., introduced S. 1092. This bill proposes inspection of fish and fishery products, inspection of facilities used in their harvesting and processing, and cooperation with States in regulating intrastate commerce.

The bill would authorize the Secretary of Health, Education, and Welfare to survey the fishing industry and, within 1 year after the act's effective date, issue minimum standards of sanitation and quality control in processing. These standards, effective 1 year after issuance, would apply to fish-processing establishments, fishing vessels, transportation, and storage. Sen. Hart noted that all fish products would have to bear an official mark or inspection legend before they could be sold at retail; also, no edible fish or fishery product could be imported into the U.S. unless processed in a country whose inspection program was 'at least equal' to that of the U.S.

At the same time, Sen. Hart introduced S. 1091. This bill would give the Department of the Interior specific authority to provide technical assistance--and to make loans to the commercial fishing industry in order to meet the requirements of the new legislation. The fisheries loan fund would be increased by $15 million for that purpose.

In the House, Rep. Rodino, N.J., introduced H.R. 7905 and H.R. 7907, covering the same ground as S. 1091 and 1092.

Disease Control

On Feb. 25, Sen. Moss, Utah, introduced S. 1151, a bill to protect the fish resources of the U.S., including freshwater and marine fish-culture industries, from the introduction and dissemination of fish and shellfish diseases.

Sen. Moss noted that the bill authorizes Federal fishery workers, whenever a serious outbreak warrants, to seize, quarantine, or dispose of any fish posing a disease threat to U.S. fisheries. This would include both imported fish and fish transported in interstate commerce.

The proposal calls for development of State-Federal cooperative programs to control fish disease. It prohibits interstate transportation of diseased fish or shellfish by common carrier or by personal means.

The bill spells out penalties for violation of fish disease-control laws. It provides protection for employes carrying out their assigned duties. It authorizes the Secretary of the Interior to compensate growers for losses due to fish disease-control programs.

Sen. Moss also referred to 3 resolutions on fish disease control: One, passed at the U.S. Trout Farmers Association convention in Oct. 1968, asks Federal assistance in controlling whirling disease of trout and other salmonids. The other resolutions, passed at the American Fisheries Society meeting in Sept. 1965, asked for establishment of a national reporting service on fish diseases, and for help in preventing importation of viral hemorrhagic septicemia.

Fishing Fleet Replacement & Expansion

Sen. Stevens, Alaska, introduced S. 936, to promote the replacement and expansion of the U.S. nonsubsidized merchant and fishing fleets.

Harassment of U.S. Fishing Vessels

Rep. Van Derlin, Calif., introduced H.R. 5277, a bill to instruct the President to impose a ban on fishery imports from countries interfering with our fishermen outside the 12-mile limit. He said the bill would be more widely applicable than the cutoff provisions of the Fishermen's Protective Act because it would cover all cases of illegal harassment--regardless of whether the fishermen involved had suffered actual financial loss.

--Barbara Lundy

OCEANOGRAPHY

Grand Banks 1969 International Ice Patrol

The U.S. Coast Guard Oceanographic Unit will conduct the oceanographic support program for the 1969 International Ice Patrol during April 1-June 30, 1969. Two oceanographic cruises to the Grand Banks region are scheduled aboard the 'Chincoteague' and 'Cook Inlet'.

The main purpose will be to conduct oceanographic surveys of the Grand Banks region to furnish real time marine environmental analysis to the Commander, International Ice Patrol. The secondary purpose will be to study the structure and migration of the semi-permanent eddy at the Tail-of-the-Banks, and to delineate the cold core of the Laborador Current.

The Operation

The temperature and salinity data will be collected by Nansen casts and/or a Salinity-Temperature-Depth Sensor System from the surface to 1500M at each station along the section survey. Temperature data will also be obtained by bathythermograph. All data will be processed at sea by digital computer and transmitted to Commander, International Ice Patrol in New York for operational use.

Data will be available at the National Oceanographic Data Center about 2 months following these cruises. These data, with analysis, will be published in the U.S. Coast Guard Oceanographic Report Series (CG-373).

Gulf of Mexico Knolls Are Salt Domes, Oil Core Analysis Indicates

The Sigsbee Knolls, extensive mounds on the floor of the Gulf of Mexico under 12,000 feet of water, have been demonstrated 'almost conclusively' to be salt domes. The find was made following laboratory analysis of oil- and gas-bearing cores taken in 1968 during an early phase of the Deep Sea Drilling Project (DSDP). The work was conducted by Scripps Institution of Oceanography under contract to the National Science Foundation.

A series of tests was made in several laboratories expert in analysis of cores containing oil, gas, and other minerals commonly found with salt domes. Scripps reported the tests demonstrated that "the oil is relatively young, that the rock is mainly calcite and sulphur, and that the rock contains an accumulation of palynomorphs (fossil pollen, primarily) of Jurassic age (about 160 million years old)."

The Knolls

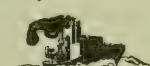
All these characteristics are found in salt domes productive of oil and gas on or near shore in the Gulf of Mexico. The test results and earlier geophysical profiling support the long-held belief that the knolls are sea-floor mounds produced over upward-thrusting salt formations.

The Knolls were discovered in 1954 as topographical features by Dr. Maurice Ewing of Columbia University's Lamont-Doherty Geological Observatory. He predicted they were salt domes and urged that drilling into one dome be given high priority on the Deep Sea Drilling Project.

In 1960, more evidence that the Knolls were salt domes was obtained by Dr. J. Lamar Worzel and John Ewing, when continuous seismic reflection profiling showed there were many buried domes in the vicinity.

'Glomar Challenger' Proves Case

At first, there was strong doubt that these structures were salt domes. It was based on the difficult problem of explaining how a great bed of salt could have been deposited on the floor of a basin as deep and as large as the Gulf of Mexico. The doubt persisted until the Glomar Challenger drilled into a dome on the first leg of DSDP.



Investigate Unseen 1,000-Mile-Long Planetary Waves in Pacific

An extensive investigation is being made in the Pacific for unseen and elusive ocean waves thought to be about 1,000 miles long and which take 2-4 weeks to complete one cycle. This is reported by the Commerce Department's Environmental Science Services Administration (ESSA).

The waves will be recorded by 15 tide gages on islands of the Caroline and Marshall groups--on an east-west line stretching 2,500 miles across the Pacific, about 500 miles north of the Equator.

Known as planetary waves, they are believed caused by the gravitational attraction of the sun and moon on the earth, and are therefore special tides. Once initiated, however, the waves apparently are very largely governed by water depth and by the effect of the earth's rotation on its axis.

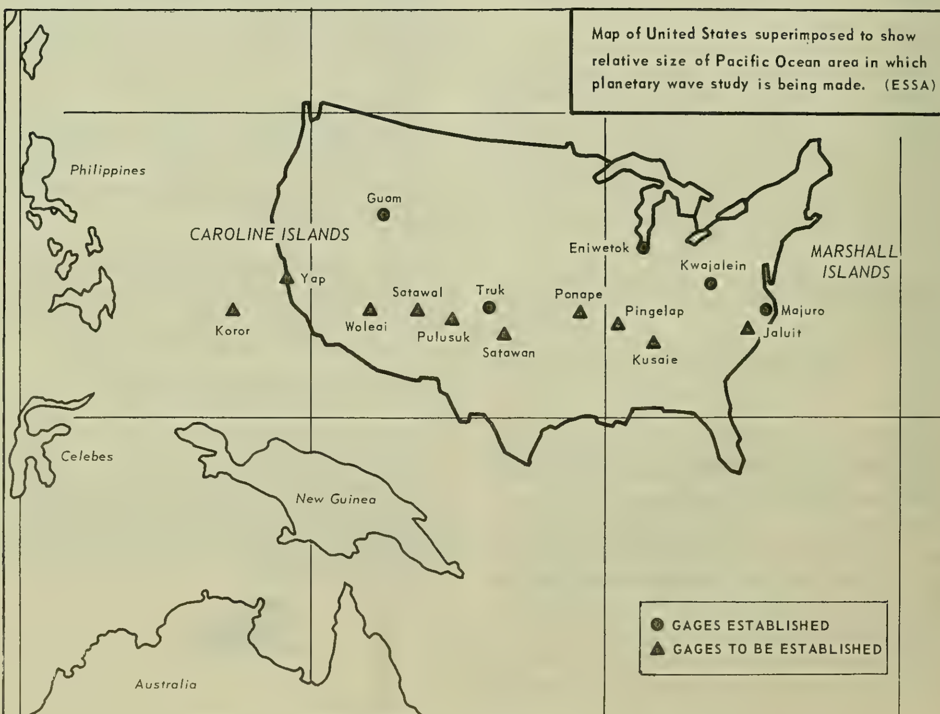
ESSA-MIT Study

The investigation is being undertaken by scientists of ESSA and the Massachusetts Institute of Technology. Data about the planetary waves will be gathered by the gages for 4 years. Then the data will be subjected to analysis by high-speed electronic computers at ESSA and MIT.

The investigation is being conducted by 3 physical oceanographers: Prof. Henry M. Stommel and Prof. Carl I. Wunsch of MIT, and Steacy Hicks, head of oceanographic research for ESSA's Coast and Geodetic Survey.

Planetary Waves

Hicks said that existence of planetary waves was established only in the present



Planetary wave observation sites.

decade primarily through work by Wunsch. Because of the waves' length and the time required to complete a cycle from beginning to end, the waves are not easily detected.

The investigators hope to answer: Do the waves move across the ocean, or do they merely oscillate back and forth in a specific area, like water sloshing in a bathtub? How high are they? What is their significance?

The researchers will look for similarities with the well-known planetary waves of the atmosphere, discovered years ago by the late Carl-Gustaf Rossby, a noted MIT meteorologist.

Hicks said: "Planetary waves of the atmosphere serve an important function in governing changes in weather. Does it follow that those of the ocean serve a similar function? In other words, what effect do planetary waves have on changes in the ocean environment? These are some of the things we will also be looking for when we study the data recorded by our gages."

Pacific Good Study Area

Planetary waves are believed to exist in all oceans, but the Pacific is regarded as particularly well-suited for the study. Numerous islands dot the area and permit correct spacing for locating the waves. Also, weather fluctuations, which would tend to complicate the records, are relatively small in this region near the Equator. However, many other waves found will have to be filtered out by a mathematical process before data can be studied.

Scripps' 'Argo' Sails To Study Drilling Sites

Only about a month after ending a 57,200-mile, globe-girdling, cruise on Jan. 30, 1969, Scripps Institution of Oceanography's Argo sailed from San Diego on March 4 on a $11\frac{1}{2}$-month, 38,340-mile expedition in the Pacific. Argo will traverse north and south Pacific Ocean in counterclockwise direction.

During Expedition SCAN, scientists and technicians will study and select 36 sea-floor sites to provide the best geological conditions for the drilling ship, 'Glomar Challenger,' as she conducts Pacific Ocean phase of Deep Sea Drilling Project (DSDP).

SCAN's Main Purpose

Prime purpose of SCAN, supported by National Science Foundation and Office of Naval Research, is to investigate types of sediments and geological formations which Challenger will drill.

New Evidence Reported of S. Atlantic Sea-Floor Spreading

Two scientists of the Woods Hole (Mass.) Oceanographic Institution have revealed new evidence of sea-floor spreading in the South Atlantic. Their findings suggest that Africa and South America were joined about 150 million years ago.

The sea-floor spreading has measured about 1 inch per year for the last 70 million years. It appears symmetrical about the axis of the Mid-Atlantic Ridge, which bisects the ocean floor between Africa and South America. The mechanism causing the spreading is not known.

These are the tentative conclusions of the Co-Chief Scientists of Leg III, Deep Sea Drilling Project, Drs. Arthur E. Maxwell, Associate Director of the Woods Hole Oceanographic Institution, and Richard P. Von Herzen, Associate Scientist. They were members of a 15-man team aboard the drilling ship 'Glomar Challenger' from Dakar to Rio de Janeiro, Dec. 1, 1968, to Jan. 24, 1969.

The Operation

Scientific teams of the Deep Sea Drilling Project are drilling and conducting preliminary core descriptions following plans of the Joint Oceanographic Institutions for Deep Earth Sampling.

Maxwell and Von Herzen said 10 holes had been drilled. More than 90% of the attempted corings resulted in recovered cores. Dr. Maxwell added: "This is a highly successful rate, even on land, let alone at sea, where the conditions are much more difficult."

The drilling took place on the flanks of the Mid-Atlantic Ridge, where the structure and

movement of the earth's crust were studied. Sedimentation revealed the age of the ocean floor at varying distances.

"The ages of the sediments, and their respective distances from the Mid-Atlantic Ridge, indicate that two points at equal distances on each side of the Ridge axis at 30 degrees south latitude have been spreading apart at the rate of two inches per year for the past 70 million years."

New Bathymetric Chart of Washington Coast Now Available

A new Bathymetric Chart of the coast of Washington covers an area from southern British Columbia to south of the Columbia River. It shows the sea floor from the coastline to approximately ninety miles west. It covers the continental shelf slope and as it descends into deep water.

The Chart is 5 feet long, 32 inches wide, and uses a cartographic technique that combines subtle shadings of color with contour lines to give a 3-dimensional portrayal of the ocean's floor.

The 2 U. of Washington oceanographers who created it--Dr. Dean McManus and Noel McGary--began working on the concept about 2 years ago with ESSA and the U.S. Geological Survey. They were aided by State of Washington agencies.

Navigation by Sounding

The Chart can be used for navigation by sounding. Coordinates can be transferred to standard charts for pinpoint surface navigation. Because of the accuracy used in assembling the 3-D portrayal of the ocean floor, the new map makes an excellent educational tool, the Oceanographic Commission of Washington states.

The Oceanographic Institute of Washington--200 Second Avenue North, Seattle, Wash. 98109--is selling the new chart for $3.50, plus 25¢ to cover mailing.

International Guide for Maritime Distress Being Prepared

An International Guide for Maritime Distress is being prepared by a committee of the Intergovernmental Maritime Consultative Organization (IMCO), reports the U.S. Coast Guard.

The guide is intended to provide instructions to merchant vessels in distress, and to those in position to assist other vessels. If accepted by IMCO, all commercial vessels flying the flags of IMCO's 67 member nations may be required to carry and comply with the guide.

New Guide's Information

At present, there are no internationally accepted standards for search and rescue--except those set up by the International Civil Aviation Organization (ICAO) to rescue downed fliers. The Coast Guard says: "The new guide will provide similar coverage for shipping. It will include instructions on emergency communications, rescue and care of survivors, and plans and coordination of large-scale searches. It will explain what actions might be expected of a distressed vessel, and how an assisting vessel can be most effective."

Foreign Fishing Off U.S. in January 1969

NORTHWEST ATLANTIC

Continuous bad weather, especially in the Mid-Atlantic Bight, restricted aerial surveillance during Jan. 1969. Nevertheless, 39 individual fishing and support vessels from the Soviet Union, and 2 from Japan, were observed. It was estimated that 25 to 30 more Soviet vessels were in the area, but these were not sighted.

Off Southern New England

Soviet: Early in the month, 8 to 10 factory stern trawlers were scattered 30 to 35 miles south of Martha's Vineyard and Nantucket. From mid-month, 10 to 15 stern trawlers were in a 20-mile area, 65 to 70 miles south of Block Island, just beyond the eastern boundary of the 'no fishing' zone in ICNAF Subarea 5. Moderate-to-heavy catches of red hake and some whiting were observed on deck and, usually, dehydration plants were operating. A few vessels fished red hake and whiting south of Nantucket.

Fig. 1 - Soviet factory stern trawler 'Sputnik' fishing for red hake south of Block Island, R.I., during Janaury 1969.

Fig. 2 - Aerial view showing substantial catch of red hake on board Soviet factory stern trawler observed during January 1969 while fishing 65 to 70 miles south of Block Island, R.I.
(Photos: Resource Management, BCF)

Off Mid-Atlantic

Soviet: Fishing activity increased early in Jan. when about 25 medium side trawlers and support vessels began fishing 25 to 30 miles off New Jersey. By month's end, the fleet had increased to an estimated 50 vessels dispersed over an 80-mile area, 20 to 25 miles offshore from east-southeast of Sandy Hook to east of Cape May. Catch was reported to be herring and some mackerel. On Jan. 29, U.S. fishermen sighted 25 to 30 side trawlers fishing herring and mackerel about 60 miles east of Cape Henry, Va.

On Feb. 4, one Japanese, 3 Polish, and 53 Soviet vessels were sighted off the New Jersey Coast.

Japanese: On Jan. 8 and 23, the stern trawler 'Sekishu Maru' was observed fishing 65 to 70 miles southeast of Cape May, in the U.S.-USSR 'no fishing' area. On Jan. 17, the stern trawler 'Shirane Maru' was sighted 70 miles south of Martha's Vineyard off Massachusetts. No catches were noted on either vessel.

U.S.-USSR Mid-Atlantic Fisheries Agreement

No violations were observed in Jan. 1969. During the first half of the month, Soviet trawlers and transports used the designated loading zones off Long Island and New Jersey. As many as 8 vessels at a time were reported in the zones.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign fishing vessels were reported in Jan. 1969.

OFF CALIFORNIA

No foreign fishing vessels were sighted in Jan. 1969; 15 Soviet fishing and support vessels were sighted in Jan. 1968.

OFF PACIFIC NORTHWEST

One Japanese longliner was sighted off Washington late in the month; catch was not identified. No Soviet fishing vessels were observed.

OFF ALASKA

Soviet: Over 130 fishery vessels had been sighted by the end of Jan. 1969--about 40 more

than in Dec. 1968, and 20 more than in Jan. 1968. Most fished herring and flounder in the central and eastern Bering Sea, respectively.

One medium trawler fished Pacific perch in the Gulf of Alaska, along the 100-fathom curve south of Kodiak Is. Perch fishing in other areas off Alaska had ceased by early January.

The herring fleet north of the Pribilofs grew from about 48 vessels in late Dec. 1968 to about 70 by end of Jan. 1969. Trawlers had good catches during the month. A BCF-Coast Guard fisheries patrol observed the herring fleet in mid-month. Stern and side trawlers' average drags lasted 1 hour. Catches ranged from 1 to 15 metric tons and averaged 6-7 tons per haul. Many trawlers appeared to be using midwater gear--the first known use of such gear in this fishery.

Eastern Bering Sea flounder fishery vessels increased from about 40 to 50 during the month.

The Soviets abandoned the groundfish trawl fishery in the central Bering Sea during early Jan. The 5 medium trawlers operating there presumably moved to the herring fishery. At least 1 reefer and 12-15 medium trawlers fished north of the Fox Is. throughout the month.

Japanese: About 40 vessels were reported in Jan., comparable to the number in Dec. 1968, but about 5 less than a year ago.

Six stern trawlers were in the Gulf of Alaska ocean perch fishery--4 fished primarily off southeast Alaska and 2 principally in the central Gulf. The 12-13 stern trawlers fishing perch in the central Bering Sea shifted to herring fishing south of St. Matthew Is. in early Jan.

Two factoryships and 14 trawlers, producing fish meal and oil and minced fish meat, operated in the eastern Bering Sea. During first 3 weeks in January, 1 factoryship and 8 trawlers fished the Continental Shelf edge, north of Fox Is. to south of St. George Is., primarily catching Alaska pollock. The factoryship returned to Japan in late Jan. The other factoryship and 6 trawlers remained on the traditional flounder grounds north of Unimak Is.

During second week of Jan., a Coast Guard Fisheries patrol, with a BCF agent aboard, observed about 12 Japanese stern trawlers and 2 side trawlers fishing herring at about 65 fathoms, northwest of the Pribilofs in the central Bering Sea. The Soviet herring fleet also fished in this area.

Four Japanese longliners fishing sablefish in the Gulf of Alaska concentrated around Cape Ommaney. Two, however, ranged as far north as the Yakutat grounds during mid-Jan. before returning to the southeast Alaska area.

South Korean: No fishing vessels have been reported since early January. Presumably the 1 stern trawler previously reported off Alaska has left.

STATES

Alaska

STATE BIOLOGISTS MAKE
1969 SALMON FORECASTS

Biologists of Alaska's Fish and Game Department have the following 1969 salmon outlook for these areas:

Bristol Bay: A preliminary forecast is for a red-salmon run of more than 18 million fish. This excludes the Japanese high-seas harvest. The run will be a decided improvement over the disaster years of 1967 and 1968. Last season, the run was about 8.5 million fish; of these, 5.5 were allowed for spawning, and 3 million were harvested. The probable red-salmon harvest in 1969 is estimated at 9 million fish.

Kodiak: The highlight will be the return of the odd-year pink-salmon cycle from the disastrous low of 1967.

Cook Inlet: In summer 1969, pink and chum salmon are expected to be in short supply in the major part of the Inlet. These species provided most of the district's canned pack in the 1968 season. The northern part of the area is expected to be most affected by the reduced run.

No forecasts were made on the Cook Inlet red-salmon runs. However, it is generally believed 1969 returns will be a little less than normal.

Prince William Sound: The area hit hardest by the 1964 earthquake is recovering. Some of the tighter restrictions imposed then are being eased.

Pink salmon runs in permitted areas will total an estimated 5.8 million, over twice the 1968 runs.

Southeast Alaska: It faces a poor salmon season and the State has issued restrictive regulations.

Pink salmon usually are the bulk of the Southeastern salmon packs. In 1968, the run was nearly 30 million, the largest in 17 years. It produced a pack of 972,000 cases.

The 1969 forecast is for only about 8 million pinks, of which 5 million will be needed for seed stocks. The low forecast is based on the poor parent year 1967 and on spawning-stream studies.

* * *

RALSTON PURINA TRIPLES
PROCESSING CAPACITY AT KODIAK

Ralston Purina has installed 3 more new-type shrimp-peeling machines at its Royal Reefer plant in Kodiak. The plant now will operate two 10-hour shrimp shifts and its production capacity will be increased 300%. It will be able to handle a total of 64,000 pounds of shrimp a day.

The firm also has arranged to add 3 more large vessels to the shrimp fleet: the 'Peggy Jo,' 'Robbie,' and the 'Alaskan'.

The firm has moved steadily towards shrimp production to supplement king-crab processing.

California

TO RECOMMEND RISE IN
SHRIMP CATCH QUOTA

The California Department of Fish and Game will recommend to the Fish and Game Commission a 50-percent increase in the commercial shrimp quota for Area A off the Humboldt-Del Norte County coast in 1969--to 3 million pounds, a million over 1968.

The recommendation followed a meeting of marine biologists with industry representatives in Crescent City on Feb. 11, 1969, to review the Department's management proposals for shrimp in Area A. The Department's marine biologists said the 1968 fall population survey indicates a population of 8.8 million pounds of shrimp on Area A beds.

Population Model Built

By constructing a population model with the aid of a computer, the biologists concluded

that a population of 7.1 million pounds will allow a harvest of 1.7 million pounds on a sustained basis. The surplus above 7.1 million pounds may be harvested safely without endangering basic breeding stocks. That would provide a basic sustained or equilibrium harvest of 1.7 million pounds, plus 1.7 million pounds of surplus shrimp, for the 1969 season. The 400,000 pounds more than the proposed quota of 3 million pounds are allowed arbitrarily for harvest by Oregon vessels. These take some shrimp off the northern portion of Area A beds.

Survey Cruise

A tentative state-industry agreement calls for a joint "in-season" population survey cruise during the 1969 season. The cost of the expensive surveys would be shared. Also, the cruise will enable the Department to draw on the talent, knowledge, and specialized fishing gear of the commercial industry. A joint survey was made during the 1968 season. It resulted in the recommendation that the quota be raised from 1.5 million to 2 million pounds. Industry also cooperated with the Department in a 1964 survey cruise.

California-Oregon Cooperation

The Department also plans to work more closely with Oregon fishery officials than in the past--on seasons and other regulations affecting the ocean resources of the 2 states.

The season for Area A--the Pacific Ocean between a line extending due west of False Cape, near Cape Mendocino, and the Oregon border--usually is May 1 through October 31, or until the quota is reached.

Washington

SHELLFISH CATCH RISES 12%

From January through October 1968, the shellfish catch in Washington State totaled 15.4 million pounds. This was an increase of 1.6 million pounds, or 12%, over the 1967 period.

Landings of Dungeness crabs reached 8.8 million pounds, up 31%. The shrimp catch of 1.2 million pounds was an increase of 9%. The production of Pacific oysters from Washington Coast was 2.8 million pounds, a rise of 12%.

There were decreases in production of hardshell and razor clams, Olympia oysters, and Puget Sound Pacific oysters.

* * *

CHINOOK SALMON
FLOWN TO NEW YORK

In December 1968, the University of Washington airlifted 100,000 selected chinook salmon eggs to the New York State Department of Conservation for spring 1969 planting in Lake Ontario. New York ordered the eggs after watching the results of plantings in Lake Michigan and Lake Superior by Michigan and Wisconsin.

New York will hold the eggs until they hatch this spring and put them in streams that feed Lake Ontario. Conservation Department officials hope the fingerlings will stay put in Lake Ontario--as their cousins did in Michigan and Superior. In the latter two, the original coho, and later chinooks, thrived on a rich food supply and the absence of natural predators. Both breeds revitalized sport fishing and business in neighboring communitities.

College of Fisheries Active

The University of Washington breeds salmon selectively each year and produces more than 5 million salmon eggs. Its College of Fisheries uses a half-million for research and development projects. The remainder are available, under strict supervision, to stock non-Washington waters.

In addition to the New York shipment, eggs were sent to Michigan, Wisconsin, Japan, and the Quinault Indian Reservation in Washington State.

Virginia

EDA EXTENDS OYSTER STUDY

The Commerce Department's Economic Development Administration (EDA) has approved technical assistance funds of $45,254 to help continue the feasibility study of establishing oyster hatcheries in the lower

Chesapeake Bay area of Virginia. The funds will be supplemented by $15,200 from the applicant--the Windmill Point Oyster Co. of Irvington, Va.

The study, begun mid-1966 to revive declining oyster production in the James River area, will be extended one year. The study has developed data on oyster spawning and setting of larvae.

1969 Program

Research this year will develop and evaluate the use of cultch-free oyster seed produced in hatcheries. It will seek to determine costs, resistance to disease, predation of young oysters--and effects on their growth of water depth, tidal currents, salinity, storms, and seasons.

The cultch-free oysters are cultivated in baskets or trays off the bay bottom. This method was developed by Windmill researchers to save the many man hours needed to operate the equipment used to handle the heavy cultch.

Maine

SARDINES PROMOTED

The Maine Sardine Council has requested BCF assistance in a nationwide educational program to encourage sardine consumption because of heavy production, large inventories, and a declining share of the market for Maine sardines.

In 1968, production was 1.6 million pounds; in 1967, 1.2 million pounds. On Jan. 1, 1969, inventories for domestic canners were 765,000 cases; on Jan. 1, 1968, 340,000 cases. Since 1957, U.S. market share has decreased from 65% to 35%.

The program is aimed at extension agents, school lunch administrators, institutional managers, professional food groups, retailers and others in the food trades through the use of newspapers, radio & television, and personal contacts.

Commonwealth of Puerto Rico

TUNA INDUSTRY GROWS

Puerto Rico's tuna industry continues to grow, reports the island's Department of Agriculture. During 1968, over 126,000 tons of tuna were unloaded and processed, 6,000 tons more than in 1967.

The established tuna cannery in Ponce, on the southern coast, will be expanded by the construction of more freezers, a warehouse, and packing lines. Another cannery will be built. In Mayaguez, on the west coast, the 3 plants have increased their facilities and plan further expansion.

Tuna seen from observation chamber of research vessel.

A Tuna Canning Center

Tuna canning is the most important food-processing industry. It employs 2,200 people. In 1968, production was over 6.3 million cases, excluding pet food, and was worth more than $80 million. "If the upward trend continues," the Department of Agriculture says, "the Island will soon be the tuna canning center of the world."

ARTICLE

A PROGRESS REPORT ON THE DEVELOPMENT OF A SHRIMP TRAWL TO SEPARATE SHRIMP FROM FISH AND BOTTOM-DWELLING ANIMALS

William L. High, Ian E. Ellis, and Larry D. Lusz

BCF has developed a trawl that separates, while fishing, shrimp from other marine animals. The design resulted from experiments aboard the 'John N. Cobb' and several cooperating Pacific Northwest commercial shrimp trawlers. Behavioral studies of the response of shrimp and associated marine animals to capturing gear contributed to the gear development.

The BCF shrimp-sorting trawl has long wings with double web panels. Shrimp pass through the large mesh inner panel and are retained by the small mesh outer panel, which leads to a cod end. Fish and other "trash" that cannot pass through the inner web lead aft, either passively or actively, to a trash chute that allows passage back to the sea bed. The shrimp-sorting trawl caught up to 2,000 pounds of shrimp per tow. This catch usually contained less than 1 percent trash, whereas conventional nets fished nearby had catches up to 80 percent trash.

Shrimp catch rates have been less when using the shrimp-sorting trawl than for conventional trawls. This problem is being studied. Time-consuming sorting, however, is nearly eliminated, and shrimp quality improved. The sorting trawl permits fishing during late evening and morning hours of darkness, and on grounds not now fished because of high trash catches. Research is continuing to further improve catch rates and separation, and to modify the trawl for other shrimp fisheries.

One major concern of commercial shrimp fishermen is the large amount of fish and bottom-dwelling invertebrates in the shrimp catches. Along the Washington and Oregon coasts, shrimp fishermen are particularly bothered with small flounders, Pacific hake, sablefish, smelt, and sea urchins.

In the Pacific Northwest, shrimp fishermen spill their pink shrimp catch from the trawl onto a large sorting table, where crew members handpick out all "trash" (unwanted fish and invertebrates caught incidentally). Because shrimp must be free of all trash and mud to be marketable, extra manpower is required to assist with this time-consuming task. If the sorting problem could be eliminated, only 3 men would be required in the crew instead of the present 4. Sorting time varies with the amount and kind of trash. A typical catch aboard a Pacific Northwest shrimp trawler might contain 1,500 pounds of pink shrimp and 5,000 pounds of trash, which would require about 3 man-hours to separate.

Some fish caught in shrimp trawls have market value but usually cannot be handled profitably along with shrimp. Moreover, some state laws prohibit large amounts of fish to be landed by shrimp trawlers.

Present trawl capture techniques damage both shrimp and fish. Shrimp are crushed by large volumes of fish, and fish are repeatedly punctured by shrimp rostrums. Broken sea

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U.S. DEPARTMENT OF THE INTERIOR
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urchins stain shrimp and are very difficult to sort from shrimp. Small-mesh shrimp trawls also capture large numbers of young fish; most of those that have air bladders, such as hake and rockfishes, do not survive when returned to the sea bed. Consequently, many fish die even when discarded.

Trash in shrimp catches reduces fishing efficiency. Vessels are often forced to cease fishing temporarily when the entire catch cannot be brought aboard at once. Part of the catch must remain in the trawl alongside the vessel until space is available on the sorting table. When the amount of trash is too great to make sorting feasible, the entire catch is dumped overboard and new grounds having less trash are sought. Shrimp trawling is not conducted during early morning and late evening because the catch is mainly trash, especially small flounders.

In May 1968, BCF's Exploratory Fishing and Gear Research Base at Seattle, Wash., began experiments and fishing trials to develop a method of reducing unwanted marine forms in shrimp catches. Experimental approaches presented in this report are based on a detailed understanding of trawl design tied closely to investigations of the behavior of shrimp and other animals.

BACKGROUND

Early Separator Shrimp Trawl Research in Europe

In 1963, French researchers experimented with a shrimp trawl designed to separate shrimp from flatfish (Boddeke, 1965). The trawl was designed on the principle that shrimp and flatfish respond differently to a stimulus--shrimp swim up into the water column whereas flatfish swim toward the ocean bottom. A conventional shrimp trawl was divided into upper and lower sections by a large-mesh curtain or panel of web. The upper section was completely closed off from the lower section. The separator panel was weighted so that it hung horizontally throughout the length of the trawl body and terminated at a junction of upper and lower cod ends. In theory, shrimp would swim up through the large-mesh separator panel and lead back into the upper cod end, while flatfish and other bottom-dwelling invertebrates would not swim through the panel and would pass out through the lower cod end, which is not tied.

The Dutch began experiments with the French sorting trawl in 1964 to determine its utility for the Dutch shrimp fishery. In their tests, the French sorting trawl had a lower catch rate than the control trawl, a traditional Dutch trawl. Consequently, a funnel-like separator was incorporated. This net had higher catch rates than the French-designed trawl and the control trawl.

Pertinent BCF Observations on Animal Behavior

Observations on the behavior or inferred behavior of shrimp to shrimp trawls was limited to data accrued during exploratory surveys and incidental "in situ" observations.

• Distribution of shrimp in trawls and inferred behavior.

When being fished, both 400-mesh Eastern otter trawls and 57-foot semiballoon trawls have large areas of closed meshes due to unequal distribution of strain on the web. Trawls have often been retrieved with hundreds of shrimp trapped in the forward top and wing meshes. Shrimp encountering the closed meshes passed through or were forced into the webbing, where they became lodged.

BCF scientists aboard the minisub 'Pisces' observed pink shrimp during dives in Puget Sound, Washington. Individual shrimp were seen both on the bottom and occasionally well up into the water column. Shrimp generally moved slowly across the bottom unless disturbed by near contact with the Piscés' skids. On these occasions, the shrimp usually jumped 1 to 2 feet sideways or upward away from the skid. Unless disturbed again, the shrimp usually made no further rapid movements.

Divers have frequently watched "broken back" shrimp (genus _Spirontocaris_) in their natural habitat. These shrimp are usually found near or beneath bottom debris, and seldom dart away unless nearly or actually touched. When the disturbing object gently contacts a shrimp, it swims a few inches away. Divers have captured individuals by hand. On one occasion, hundreds of "broken back" shrimp were on the bottom near a submerged log. When divers moved through them, the shrimp jumped up to 2 feet off the bottom or sideways using several snapping motions.

- Observed fish behavior.

A primary consideration in developing a sorting trawl is the behavior of fish which are to be sorted. Scuba diving scientists have observed smelt (Osmeridae) and Pacific herring (Clupea harengus pallasi) many times within the influence of a trawl. In most instances, these fish oriented and swam with the trawl near the uppermost side and top web panels. Escape was usually attempted through the top of the trawl (High and Lusz, 1966). These fish appeared content to swim for long periods in the trawl without tiring or exhibiting distress. But when subjected to sudden diver motions, many fish would dart through upper meshes of the net.

Flounders, on the other hand, invariably swim downward seeking an escape route out of a bottom trawl and seldom rise more than 3 feet from the bottom at any time. Only a small space is necessary between the trawl footrope and ocean floor to allow great numbers of flounders to pass beneath the trawl footrope and escape.

Other near-bottom species, such as Pacific cod (Gadus macrocephalus), sablefish (Anoplopoma fimbria), spiny dogfish (Squalus acanthias), surf-perches (Embiotocidae), some species of rockfishes (Sebastodes spp.), lingcod (Ophiodon elongatus), and cabezon (Scorpaenichthys marmoratus) respond in a manner between the two extremes. Individuals of all these species have been observed escaping beneath a trawl footrope that was 6 to 12 inches off the bottom. Rarely do any rise more than 15 feet after coming within the trawl's influence in an effort to escape. Usually these species swim ahead of the footrope 2 to 5 feet off the bottom. When the footrope eventually passes beneath them, they turn toward either side of the trawl and, sometimes, rise several feet. All species observed, except smelt and herring, move quickly back to the trawl intermediate or cod end after being totally enclosed by web. Salmon (Oncorhynchus spp.) and halibut (Hippoglossus hippoglossus) are the only species observed that swam forward and escaped out of the trawl mouth after being more than about 15 feet aft of the footrope.

PRELIMINARY RESEARCH

Limited trials were made by the BCF Juneau Exploratory Fishing and Gear Research Base, and later by the Seattle Exploratory Fishing and Gear Research Base, to determine if the French-type separator trawl was effective in the North Pacific pink-shrimp fishery. Following these limited trials, which produced inconclusive but encouraging results, an intensive trawl net development program was begun by the Seattle Base. Results of Seattle's program to date are described below.

Model Separator Panel

Two small trawls, a Gulf-of-Mexico shrimp try net, and a one-quarter scale model 57-foot semiballoon trawl were built with horizontal separator panels of 3-inch web leading to upper and lower cod ends. After underwater observations, both trawls were modified. The separator panel was shortened, additional leaded line was attached, and aluminum trawl floats were tied on the trawl top panel to ensure space between the separator panel and the trawl top.

Both nets were tested in Port Susan, Washington, on sparse populations of pink shrimp. Although catches were low, only about 40 percent of the shrimp were in the upper bag of the model and try nets.

57-Foot Semiballoon Separator Trawl

From experience gained with the model trawls, a standard 57-foot semiballoon trawl then was modified with a separator panel and a second cod end. Unfortunately, tests with this modified trawl aboard the trawler 'Tradewind' on commercial shrimp grounds off central Oregon achieved poor separation of shrimp from trash. These results suggested the need for a different method of separating shrimp from trash in the Northwest shrimp fishery.

DEVELOPMENT OF SORTING CONCEPT

Before a successful separator trawl could be developed, it was necessary to further understand the underlying reaction of shrimp and fish to webbing. Therefore, an experimental cruise was conducted with our research vessel John N. Cobb off central Oregon. The primary purpose was to test shrimp trawls with experimental devices for separating shrimp from trash, and to determine behavior patterns of shrimp relating to their capture.

Several trawl configurations were tested. Each was a step toward determining shrimp

reactions and providing a basis for future commercial trawl design. These various configurations were not intended to operate as commercial trawls.

Retaining Covers

As noted earlier, shrimp had been observed hanging partially through wing and top meshes of conventional bottom trawls and 57-foot semiballoon shrimp trawls when retrieved. Their presence indicated that some shrimp escape through the net and that the rate of escape might be very high in areas where the meshes are fully open. Therefore, in an attempt to determine the degree of escapement, small covers were placed over the trawl in strategic places.

Nine-foot square pieces of $\frac{3}{4}$-inch mesh web were laced at 5 locations to the outside of a 2-inch mesh 57-foot semiballoon shrimp trawl. Each piece covered a $4\frac{1}{2}$-foot square area, thus creating a pocket to hold shrimp that passed through the larger web. Fig. 1 shows the location of these covers.

In four 30-minute tows, considerably more shrimp were captured in the side covers than in the top covers. The average number of shrimp in each pocket was: position 1--31.2, position 2--14.2, position 3--66.0, position 4--6.8, and position 5--3.0. The trawl cod end contained an average of 75 pounds of shrimp and 210 pounds of fish.

The results indicate that the greatest escapement occurred near the intermediate. The lack of fish or other trash in any pocket suggests that marine animals other than shrimp may lead along the trawl web, did not contact the trawl in covered areas, or were too large to pass through the webbing.

Side Panel Covers

The purpose of the second experiment was to assess the total amount of escapement through the side panels.

A large panel of $\frac{3}{4}$-inch mesh web was attached outside each 2-inch mesh trawl side panel from the wingtip to cod end. The panels were laced along the seams in the forward part of the net and departed from the seams aft to retain a constant vertical size (Fig. 2). Near the intermediate, the panels nearly circumscribed the net. Shrimp passed through the trawl web and led aft along the small mesh external cover to special cod ends

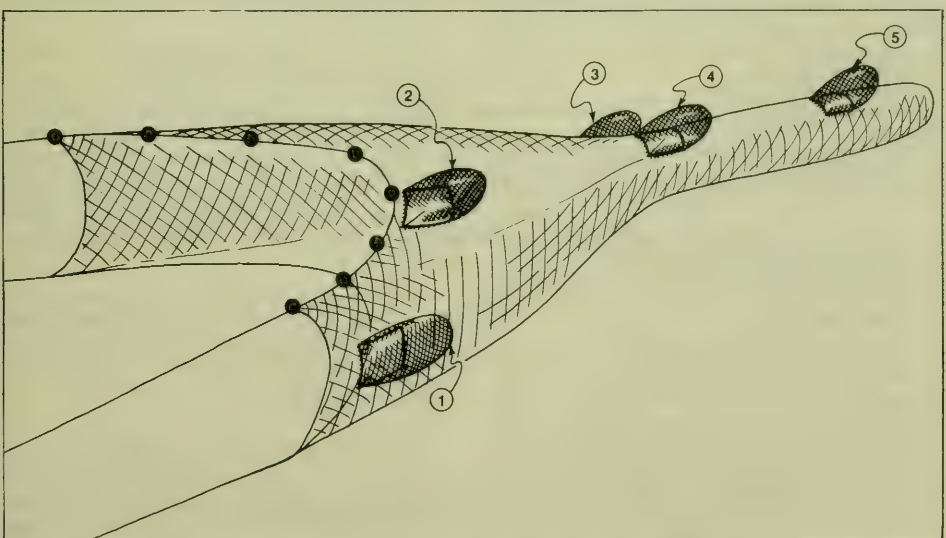

Fig. 1 - Schematic drawing of a 57-foot semiballoon trawl with five small-mesh retainer bags to collect shrimp that passed through trawl meshes.

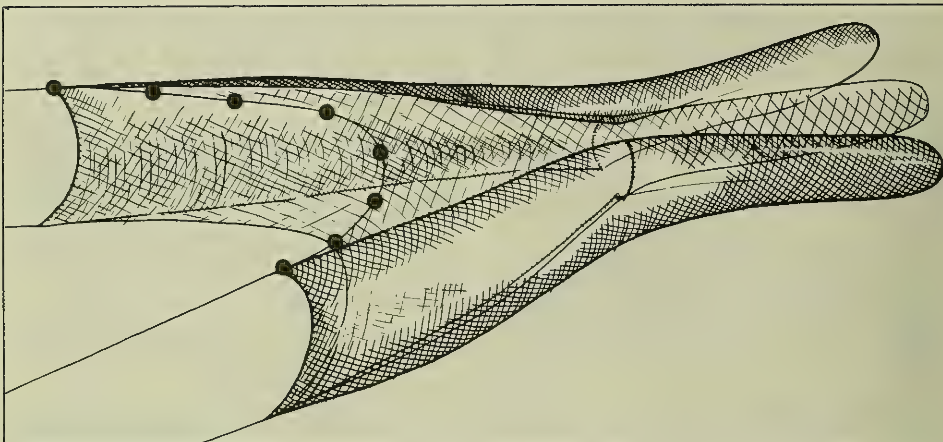

Fig. 2 - A 57-foot semiballoon trawl with exterior covers of $\frac{3}{4}$-inch web along the side panels terminating in individual cod ends.

terminating each cover panel. Organisms that did not pass through the 2-inch web were lead into the $1\frac{1}{2}$-inch mesh trawl cod end.

Six 30-minute tows produced 530 pounds of shrimp and 870 pounds of trash in the trawl cod end--and 805 pounds of shrimp and 35 pounds of trash in the 2 side covers. Sixty percent of the total shrimp catch and 4 percent of the total trash were in the exterior side cover (Fig. 3).

Top Panel Cover

The next experiment evaluated the total amount of shrimp escapement through the top of the trawl.

An external retaining panel of $\frac{3}{4}$-inch mesh web was laced along the top panel of the 2-inch mesh trawl (Fig. 4). Shrimp that passed through the top of the trawl were led aft to a separate cod end.

Results of nine 30-minute tows showed that catches in the trawl cod end totaled 980 pounds of shrimp and 2,655 pounds of trash. The external top panel contained 395 pounds of shrimp and 65 pounds of trash. Twenty-nine percent of the total shrimp catch, and 2.4 percent of the total trash, were in the exterior top panel. The trash was almost entirely smelt and a few very small flounders (Fig. 5).

Combined External Trawl Cover

Catches of nearly pure shrimp in the exterior covers were great enough to suggest this dual web concept as a means to separate shrimp from trash. Consequently, this experiment was designed to enclose all trawl meshes.

Trawl liner configurations similar to those used in the side panel and top panel experiments were combined with an additional small-mesh sleeve placed around the trawl intermediate and cod end. The trawl intermediate was also lengthened, using $1\frac{1}{2}$-inch web and hung-in 29.3 percent to supporting riblines, to allow the meshes to open more fully and thereby facilitate the passage of shrimp. Only the trawl belly remained unlined.

The results of 4 tows indicated that the 2-inch and $1\frac{1}{2}$-inch web nearly completely separated shrimp from trash. Of the total shrimp catch, 87 percent to 97 percent was in the external cover bags. Fish in the cover bags was limited to smelt.

Most noteworthy was the fact that the majority of adult shrimp escaped through both $1\frac{1}{2}$-inch and 2-inch webbing to be retained by the small mesh cover while fish and other trash were retained separately in the large mesh cod end.

Fig. 3 - The combined catch in two covers attached to trawl side panels made up 60 percent of the total shrimp catch. Note the many fish in the trawl cod end, whereas only a few smelt are scattered in the separated catches.

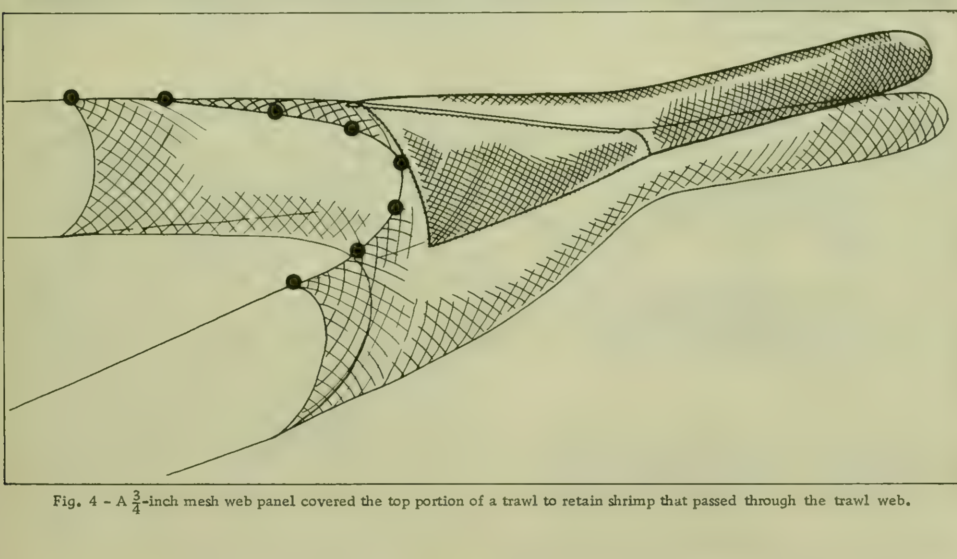

Fig. 4 - A $\frac{3}{4}$-inch mesh web panel covered the top portion of a trawl to retain shrimp that passed through the trawl web.

Fig. 5 - This photo shows a catch of shrimp and trash that passed through the top trawl web and the catch in the trawl cod end.

EXPERIMENTAL TRAWL DESIGNS

Data gathered during the John N. Cobb cruise, combined with our prior information, provided a direction for continued research to develop a prototype commercial trawl--one that would effectively capture and separate pink shrimp from fish and bottom-dwelling invertebrates.

Two experimental shrimp trawls were constructed: one trawl was a modification of an existing commercial fishing net, the other was a new radical design.

Bottomless Trawl

This trawl was designed to allow trash species to escape under the trawl, and to stimulate shrimp to pass upward through a large mesh separator panel into the cod end.

A 57-foot, conventional, semiballoon shrimp trawl was modified for testing. The bottom web panel and footrope were removed and replaced with 3 tickler chains. The tickler chains were attached equidistant along the length of the body to stimulate shrimp off the bottom and to maintain trawl shape. The top panel, side panels, and cod end were lined interiorly with small-mesh webbing to prevent shrimp from escaping through the $1\frac{1}{2}$-inch meshes. A 3-inch mesh separator panel was laced along the headrope and extended back along the center of the side panels to the lower side of the cod end; this created a near-horizontal curtain aft of the trawl mouth. The separator panel was weighted so that it would be suspended in the trawl's center during fishing and would form a large, enclosed, compartment into which swimming shrimp could enter easily. The lower section of each side panel served as a skirt to prevent shrimp from escaping horizontally. The bottom of each side panel was weighted to keep the trawl on bottom.

Fishing trials of the prototype bottomless trawl were conducted on shrimp grounds near Newport, Oregon. To test the efficiency of the experimental trawl, the John N. Cobb made 2 tows adjacent to a commercial trawler, the M/V 'Jaka-B,' which was using a conventional, 57-foot, semiballoon trawl. The comparative tows produced about the same amount of shrimp for each vessel. Owing to low availability of shrimp during the testing period, shrimp catches were very small; therefore, results were not conclusive. Further testing is planned.

BCF Shrimp-Sorting Trawl

In design this new trawl departs radically from conventional shrimp trawls. It has neither a top nor bottom panel but a double wall of webbing in the wings to separate shrimp from fish and bottom debris (Fig. 6). The inner panels of the double-walled wings are of meshes large enough for shrimp to pass through, and the outer panels are of meshes small enough to retain the sorted catch. Size of shrimp contained in the outer bag would naturally be governed by mesh size. Smelt and other fish that tend to swim upward could pass over the top of the new trawl.

Fish and debris that did not pass through the large meshes of the inner panel in the wings eventually pass through a trash chute out of the trawl unharmed. Because all shrimp were not expected to pass through the wing sieve web, the trash chute was constructed of large-mesh web, which would allow some of these shrimp to go into the retainer bag. Those shrimp that continued through the chute without passing through any meshes would eventually be captured in the trash bag, or deposited back onto the sea bed if the external portion of the chute was not closed.

After construction of the new trawl, diver observations determined that the overall configuration was adequate for testing.

Fishing Trials

Initial field trials of the BCF shrimp-sorting trawl were conducted on shrimp beds off Newport, Oregon. These were reported to have small-to-moderate amounts of shrimp but large amounts of trash fish and sea urchins. The John N. Cobb made 9 tows with the net. In every tow, the trash content of the separated shrimp catches was less than 3 percent by weight, and no sea urchins were

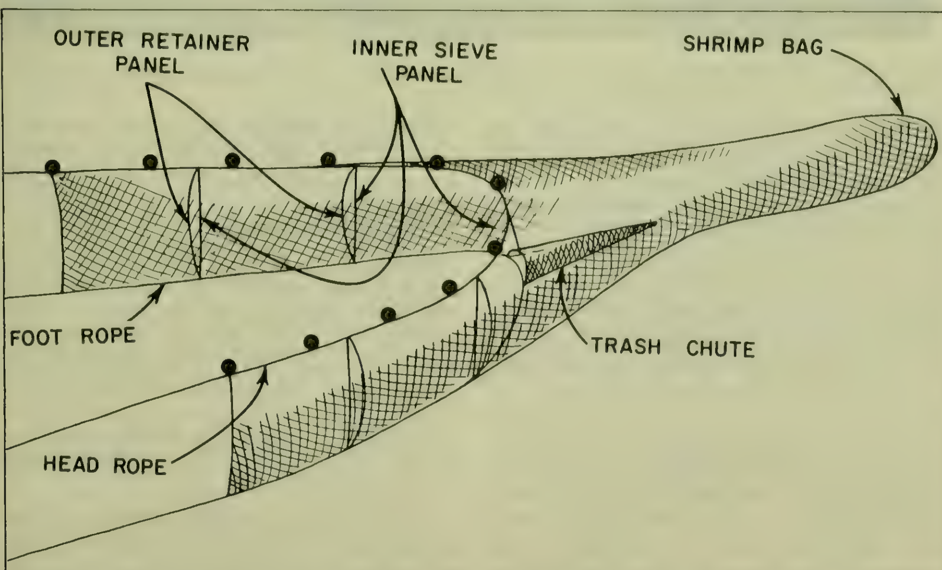

Fig. 6 - Schematic drawing of the BCF shrimp sorting trawl featuring long double panel wings and a short trash chute.

Fig. 7 - A nearly pure shrimp catch is dumped from a BCF shrimp sorting trawl onto the M/V Washington's sorting table. This 2,000-pound catch of shrimp had less than 20 pounds of smelt and flounders.

taken. Four 30-minute tows yielded 555 to 735 pounds of separated shrimp per tow, and one 30-minute tow yielded only 265 pounds. A 1-hour tow caught 610 pounds of shrimp and 15 pounds of trash, while the commercial vessel Jaka-B fishing nearby with a conventional trawl caught 500 pounds of shrimp and 55 pounds of trash. One 2-hour tow near the Jaka-B produced 780 pounds of shrimp and 25 pounds of trash in the sorting trawl, while the commercial vessel had 800 pounds of shrimp and 390 pounds of trash. The two remaining 2-hour shrimp-sorting trawl tows produced 625 pounds and 1,825 pounds of shrimp.

The sorting trawl was then placed aboard the 65-foot commercial shrimp trawler 'Washington,' which operated off the northern coast of Oregon. The first tow was made with a standard, 57-foot, semiballoon trawl which took 1,400 pounds of shrimp and 4,900 pounds of fish and trash. In 8 succeeding tows with the BCF shrimp-sorting trawl, catches ranged from 1,000 to 2,000 pounds of shrimp. Four percent trash occurred in one evening tow; 1 percent or less trash was captured in the other 7 daytime tows (Fig. 7). All catches included many small, gray, cragonid shrimp. Tows in the same general area and of similar duration made by the 'Trask' and 'Western Maid' using conventional shrimp trawls took more shrimp than the BCF shrimp-sorting trawl, but their catches also included up to 5,000 pounds of trash per tow. On the following trip, the Washington using the wing trawl also made smaller catches of shrimp than did vessels using the conventional shrimp trawl. Furthermore, it was noticed that the Washington often traveled only 60 percent of the distance covered by vessels using standard shrimp trawls.

Use of the trawl by the Washington on the 2 trips indicated a need for further gear modifications to (1) increase average size of pink shrimp captured by using web with larger meshes in the inner and outer panels, (2)

Fig. 8 - This 1,500-pound catch of shrimp could be dumped into the vessel's hold after washing without time-consuming hand sorting.

reduce incidental catch of unwanted cragonid shrimp, (3) improve handling alongside the vessel by lengthening the shrimp bag, and (4) increase the catch of pink shrimp.

A second wing trawl was then constructed and tested aboard the Washington. It also had a 100-foot headrope and 106-foot footrope. The wings as observed by scuba divers opened about 5 feet vertically. The inner panel wings were of 2-inch No. 12 knotted nylon. Outer panel wings of $\frac{7}{8}$-inch knotless nylon were attached to $1\frac{1}{16}$-inch No. 18 knotted nylon in the body and shrimp bag sections.

Fishing trials with the modified sorting trawl continued to demonstrate the potential of this design. Catches, although still smaller than those of nearby trawlers, were of commercial size. Almost no trash was captured with the sorting trawl, and the shrimp could be placed directly into the hold for icing without sorting (Fig. 8). On the first day, the catch rates were 1,460 pounds per hour by the Washington with the sorting trawl, 1,380 pounds per hour by Trask (conventional trawl), and 1,285 pounds per hour by Western Maid (conventional trawl). The following day the Washington made 2 tows and took 805 pounds per hour, while the Trask took 2,380 pounds per hour, and the Western Maid 2,100 pounds per hour.

The BCF shrimp-sorting trawl still retained some small shrimp because of its $1\frac{1}{16}$-inch retainer web as compared to $1\frac{1}{2}$-inch web of commercial trawls. Table shows age

Age Composition of Shrimp Taken October 8-9, 1968, in A 57-Foot Semiballoon Trawl and A BCF Shrimp-Sorting Trawl (Unpublished Data, Oregon Fish Commission)

Age	Carpace Length	57-Foot Semiballoon Trawl with $1\frac{1}{2}$-Inch Web	BCF Shrimp-Sorting Trawl with $1\frac{1}{16}$-Inch Web
	mm.	%	%
1	15.5-17.5	3.5	7.0
2	18.0-21.5	61.3	62.2
3 & older	22.0-25.0	35.1	30.8

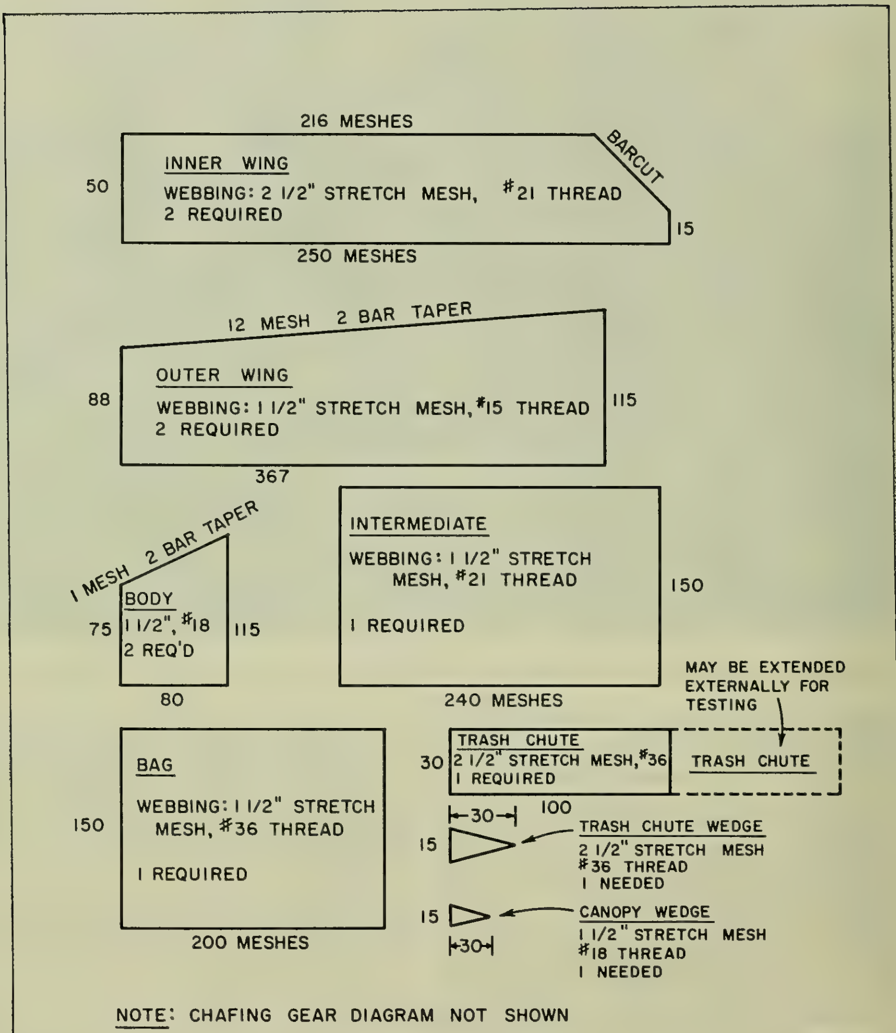

Fig. 9 - Sample cutting diagram for BCF shrimp sorting trawl.

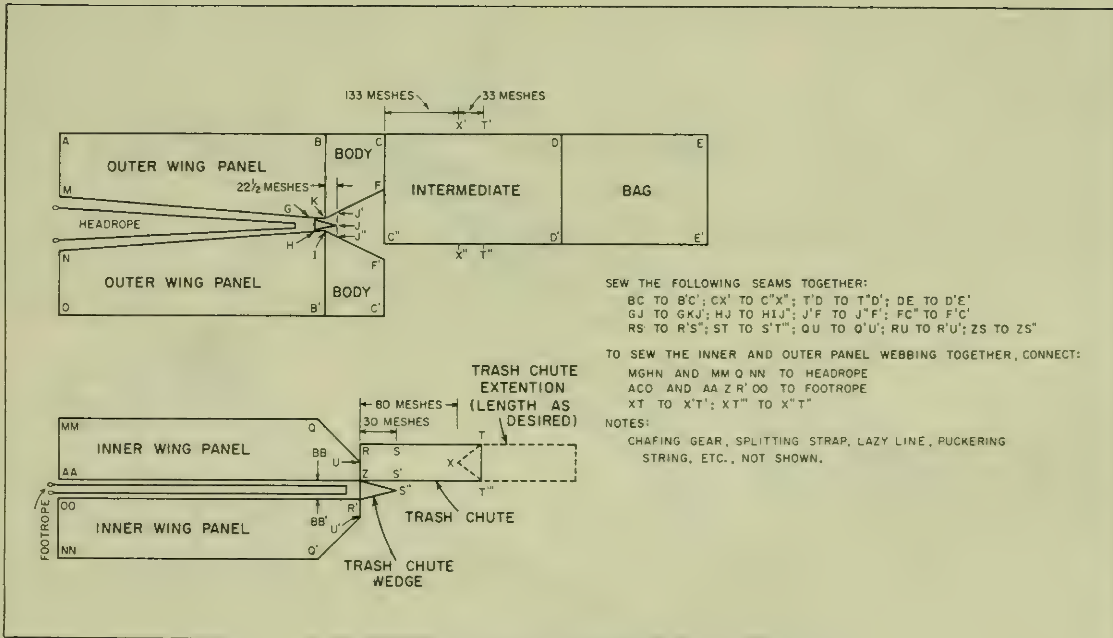

Fig. 10 - Sample construction plans for BCF shrimp sorting trawl.

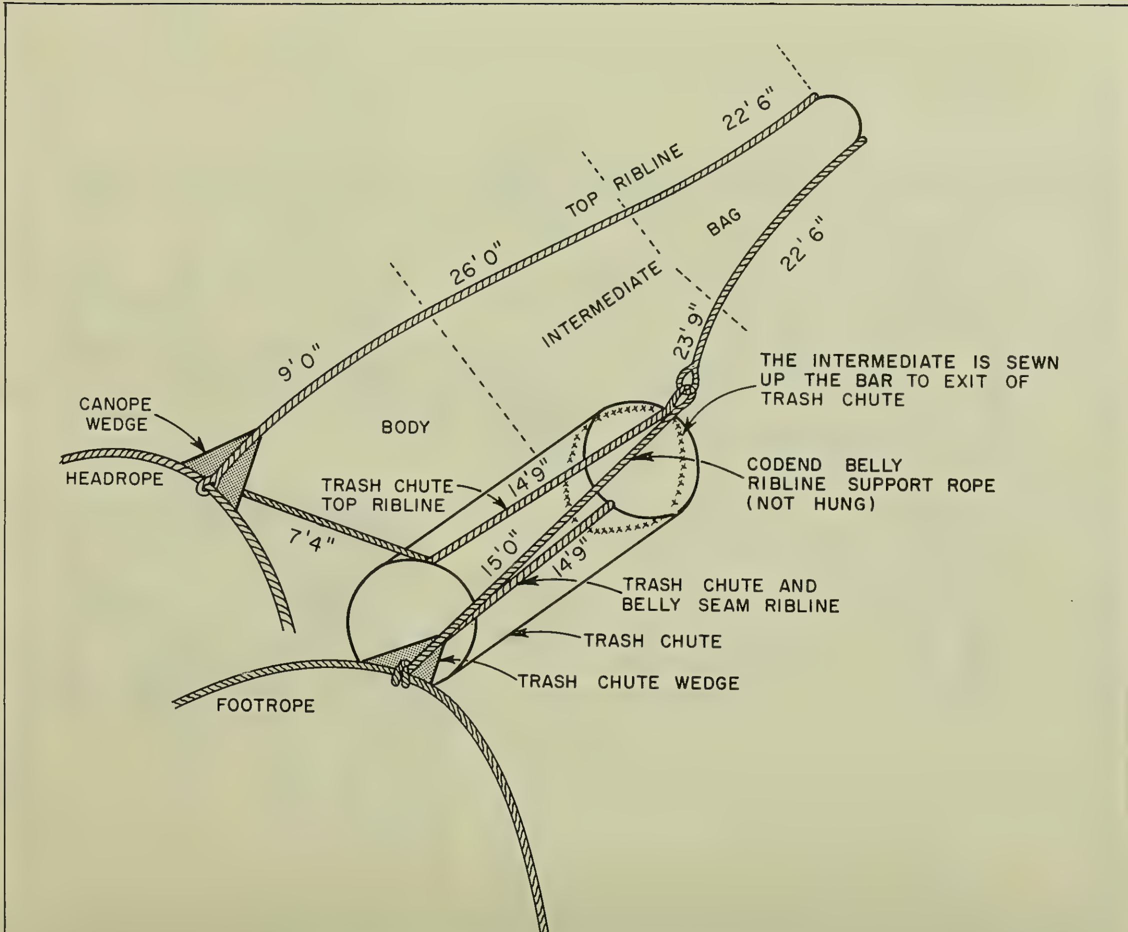

Fig. 11 - Details of ribline and trash chute for the BCF shrimp sorting trawl.

composition of shrimp taken in the 2 types of trawls. The sorting trawl took shrimp of considerably higher quality than did the other vessels. Samples taken by a biologist of the Oregon Fish Commission indicated that, although shrimp taken in the sorting trawl averaged slightly smaller in length than those taken in shrimp trawls, fewer were needed to weigh a pound (75 per pound, in contrast to 81 per pound from other vessels). He suggested this phenomenon was due to the fact that shrimp caught by conventional trawls are frequently broken and crushed, causing a loss of body parts and fluids, whereas those taken with the sorting trawl were undamaged because there were no large quantities of trash in the cod end.

Sample Construction Method

The BCF shrimp-sorting trawl cannot have the same design for all fisheries. Factors such as vessel size and horsepower, species fished, type of trash, and bottom composition will dictate certain modifications for greatest efficiency. However, it is appropriate to present a typical plan to show methods of construction.

Fishermen considering construction of a sorting trawl must realize this is an illustrative design. It is not necessarily intended for use in commercial fisheries in its present form. The sample trawl illustrated here might apply to the large prawns typically found in the Gulf of Mexico, whereas a trawl constructed of smaller meshes, such as 2-inch for inner panel and 1-inch for outer panel, would be appropriate for pink shrimp along the Washington and Oregon coasts.

The cutting diagram shown in figure 9 includes each web section required. Figure 10 illustrates the web attachment points. Ribline configuration and trash chute details are shown in figure 11.

DISCUSSION

Despite lower catch rates, it is anticipated that design changes will bring harvesting rates up to those of conventional shrimp trawls. Even in their present form, trawls employing the new concept in shrimp separation in their design have several advantages for use in Pacific Northwest waters: (1) less manpower is required due to reduced sorting time, (2) fishing time is not lost to sorting shrimp from trash, and fishing may be extended to hours of darkness, (3) grounds considered unfishable owing to excessive trash can be harvested with this gear, and (4) product reaching the market is superior and may command a higher price.

Two sorting trawls are now undergoing tests in the Pacific Northwest pink-shrimp fisheries. One trawl has somewhat higher wings to capture shrimp several feet off bottom. The 50-foot headrope makes the trawl small enough for use by low-horsepower vessels. The other has a modified trash chute to increase shrimp catch rates.

This paper is as an interim report. Additional studies and at-sea fishing trials are underway to develop a shrimp-sorting trawl suitable for commercial fishing.

Fishery regulations in some regions now prevent use of this type trawl because of the small-mesh construction.

Designs are completed for sorting trawls modified to cope with conditions existing in other fisheries. Information gained thus far in the developmental program suggests that it may be feasible to sort small shrimp from larger shrimp through use of multiple sieving.

Additional behavior studies were begun in January 1969 and will continue throughout the year to further develop trawls using the new sorting principle. To accelerate this program, we will use underwater television and automatic deepwater cameras to learn more about the behavior of shrimp to fishing gear in situ, and then relate these observations to the trawl design.

ACKNOWLEDGMENTS

We thank the captains and crews of the commercial shrimp trawlers, Washington, Tradewind, Trask, Western Maid, and Jaka-B for their cooperation during field trials of experimental nets; Jack Robinson, Fishery Biologist, Oregon Fish Commission, who collected shrimp age and size information; and Steve Marinovich, who supplied model trawls.

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ANTARCTIC

'An Ostracod Fauna from Halley Bay, Coats Land, British Antarctic Territory,' by J. W. Neale, British Antarctic Survey, Scientific Report No. 58, London, 1967, 50 pp., illus., $3.36.

Twenty-six species of podocopid ostracods are present in a high Antarctic fauna obtained from Halley Bay. Diagnoses are given of the two new genera 'Antarcticythere' and 'Myrena.' The new species 'Cativella bensone,' 'Loxocythere frigida' and 'Robertsonites antarcticus' are described. Comparisons are made with other described fauna from the Antarctic.

MARINE MAMMALS

'The World of the Walrus,' by Richard Perry, Taplinger Publ. Co., New York, 1967, 162 pp., illus., $5.95.

For a thousand years, since the days when the Vikings were hunting the hvalross, or whale-horse, off the North Cape early in the ninth century, man has persecuted the walrus relentlessly. During the past 100 years, between 2 and 3 million walruses have been slaughtered in the Bering Sea alone; no one has calculated how many more in the Canadian and Norwegian Arctic. By the 1930s, their world population was less than 100,000; their continued existence as a living species was endangered.

Despite this record, our knowledge of the walrus life history is both fragmentary and confused. It is extremely difficult to maintain contact with the herds among the remote icefields, and they do not breed ashore in vast rookeries as do their relatives, the fur seals and sea lions. Nevertheless, a mass of material has been gathered by zoologists, much of it both circumstantial and contradictory. Mr. Perry has straightened out this maze of fact and inference to expose the unexpected fact of walrus life and society.

MODERN FISHERIES

'Science for Better Living,' Yearbook of Agriculture, Dept. of Agriculture, 1968. U.S. Govt. Printing Office, Washington, D.C., 386 pp., illus., $3.

This Yearbook takes a very broad view of agricultural research. Subjects range from the alfalfa bee to the weed-eating sea cow, from balloon logging to WURLAN wool fabric, from a low-calorie cheese to farming by space satellite.

The intricacies of managing fishery resources and harvesting food from the sea and inland waters are covered in a chapter written by Dr. Sidney Shapiro, BCF's special assistant for resource development. It deals with numerous modern developments in fishery biology and technology: for example, productivity of the sea, underwater marine research, spacecraft oceanography, and fish culture.

OCEANOGRAPHY

'The Ever-Changing Sea,' by David B. Ericson and Goesta Willin, illustrated by Ingrid Niccoll, Alfred A. Knopf, New York, 1967, 349 pp., $7.95.

Revelations of the past two decades about the oceans--their deeps, currents, topography, and their origins--have given us more knowledge than had been acquired in all the millenia since venturesome upper-paleolothic men first set out upon the deeps in skin boats. David Ericson and Goesta Wollin, themselves distinguished oceanographers, have brought the story up to date.

They tell how new equipment and ingenious instruments, such as the echo sounder, the

corer, and the seismic profiler, have brought to the surface data that give an utterly new view of the sea's secrets. From this new knowledge has come an understanding of other fields of learning. This book illustrates how the study of the sea and its terrain has given insights into the physical evolution of the earth itself, evidence about the formation of continents, the nature of the earth's crust, the beginnings of life, life in the great deeps today, and the 'new economics of the oceans.'

'Oceanography of Baffin Bay and Nares Strait in the Summer of 1966 and Current Measurements in Smith Sound, Summer 1963,' by Kennard M. Palfrey, Jr. and Godfrey Day, U.S. Coast Guard Oceanographic Report No. 16, U.S. Govt. Printing Office, Washington, D.C., 1968, 204 pp., illus.

The summer of 1966 climaxed the most unusual year in the history of the International Ice Patrol, by virtue of a phenomenal lack of ice and abnormally warm temperatures. This report attempts to document the oceanographic conditions in Baffin Bay at that time, including data collected during a comprehensive and synoptic investigation of Baffin Bay and Nares Strait. Measurements of temperature, salinity, and dissolved oxygen are presented, emphasizing the development of the circulation of Baffin Bay.

OCEAN BIRDS

'Birds of the Atlantic Ocean,' by Ted Stokes, illustrated by Keith Shackleton, MacMillan Co., New York, 1968, 156 pp., $12.95.

This book offers the most complete collection of illustrations of ocean birds ever published. The celebrated British painter and illustrator Keith Shackleton has included reproductions of 15 of his oil portraits of birds of the Atlantic ocean in full flight. To these have been added 23 plates of gouache drawings pointing up each bird's distinguishing characteristics and features of special interest.

The birds run the full gamut from penguins, albatrosses, petrels, tropic birds, and pelicans to cormorants, frigate birds, phalaropes, skuas, gulls, terns, skimmers, and auks. Mr. Stokes, a well-known ocean bird enthusiast, presents the birds in correct systematic sequence, giving their order, family, species, and common names.

OIL POLLUTION

'Manual on the Avoidance of Pollution of the Sea by Oil,' Great Britain Board of Trade, London, 1967, 22 pp., 2 charts. Her Majesty's Stationery Office, 30¢.

In recent years, strenuous efforts have been made, both nationally and internationally, to solve the problem of oil pollution. By November 1967, 36 countries had accepted an International Convention for the Prevention of Pollution of the Sea by Oil. The provisions of the Convention have been given legal effect for British ships registered in the U.K.

The law can impose penalties, but pollution of the sea will cease only if every master, officer, and seaman--and those on shore who transfer oil to and from ships--do all they can to prevent oil getting into it. This manual seeks to assist them by setting out methods of avoiding the discharge, spillage, or leakage of oil.

FISH PASSAGE THROUGH TURBINES

'Diel Movement and Vertical Distribution of Juvenile Anadromous Fish in Turbine Intakes,' by Clifford W. Long, Fishery Bulletin, Vol. 66, No. 3, Fish and Wildlife Service, Dept. of the Interior, 1968, pp. 599-609, illus. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

The behavior of fingerling salmonids in turbine intakes, including their time of passage and distribution in the water mass, can profoundly influence development of efficient and economical methods for reducing fish mortality in turbines. The need for fish protection at dams is becoming particularly acute in the Columbia Basin because the progeny of upriver stocks of salmonids soon will be forced to pass through the turbines of 8 to 10 dams to reach the sea. This paper reports on experiments at 2 dams on the Columbia River to acquire data on timing and distribution of fingerling salmonids entering turbine intakes.

'A Compendium on the Success of Passage of Small Fish through Turbines,' by Milo C. Bell, Allen C. DeLacy, Gerald J. Paulik, and Richard A. Winnor, Fisheries Engineering Research Program, U.S. Army Engineering Division, North Pacific Corps of Engineers, Portland, Ore., May 1967, 268 pp., illus.

Hydroelectric development on watersheds containing indigenous populations of anadromous fish causes concern for the safety of juvenile forms that must pass through penstocks and turbines on their way to the sea. Many investigations have been undertaken over the years to determine levels of turbine mortality and the causative factors at specific projects. This report presents an analysis of existing information and makes recommendations for future work.

ANIMAL NAVIGATION

'Animal Orientation and Navigation: Proceedings of the 27th Annual/Biology Colloquium, Mar. 6-7, 1966,' edited by Robert M. Storm, Oregon State Univ. Press, 1967, 134 pp., illus.

This book records a conference held to bring together several active researchers in vertebrate orientation and navigation so that they might present a timely review of accomplishments and remaining problems.

Dr. Arthur D. Hasler reviews his research on fish orientation, stressing their use of olfactory and visual clues. Dr. Denzel Ferguson discusses sun orientation by frogs and toads. Dr. Archie Carr reviews research on sea-turtle orientation and navigation. Dr. Kenneth S. Norris reviews the known migrations of marine mammals and the navigation problems involved, the known orientation mechanisms, and he speculates on others that may be operative. Other papers discuss certain aspects of migration by birds.

PARASITES

'Some Parasites of O-Group Plaice, 'Pleuronectes platessa' L., under Different Environmental Conditions,' by K. MacKenzie, Dept. of Agriculture and Fisheries for Scotland, Marine Research Report No. 3, 1968, 23 pp., illus., $1.40. Her Majesty's Stationery Office, Edinburgh.

The parasites of O-group plaice, living under artificial conditions in open-mesh submerged tanks in a sea loch on Scotland's west coast, are compared with those of the natural population of O-group plaice in the same loch. From the 263 plaice examined in this study, 19 species of parasites were recorded.

The report gives data on the incidence and intensity of infestation of each parasite. It discusses the potentially harmful parasites of young plaice under intensive fish-farming conditions.

PLANKTON

'Dinoflagellates of the Caribbean Sea and Adjacent Areas,' by E. J. Ferguson Wood, Univ. of Miami Press, 1969, 144 pp., illus., $12.

Dinoflagellates, microscopic, single-celled, plantlike organisms, form a significant element among the plankton. They are important in marine food chains and are of interest to marine biologists and to researchers in many other fields.

Students of the Caribbean region ecology, and even nonspecialists in marine microbiology, will be able to identify specimens of dinoflagellates found in plankton catches by using this atlas and guide. Dr. Wood describes and gives locations for 400 species. The detailed illustrations are particularly useful for identification purposes. There is an appendix treating the 6 species of Siliboflagellates that have been recorded in the Caribbean.

PROCESSING

'Sanitation Guidelines for the Breaded-Shrimp Industry,' by Joe P. Clem and E. Spencer Garrett, 14 pp., illus., Circular 308, 1968. Fish and Wildlife Service, Dept. of the Interior. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

The ever-increasing application of technology by the food-processing industry makes the sanitation measures used some years ago inadequate. As processing becomes more complex and sophisticated, so do the sanitation problems. Large numbers of workers standing along the processing lines handle the product. If any one of them is guilty of the slightest hygienic malpractice, he may contaminate the product and affect the health of hundreds of consumers.

The solution lies in rigid control of plant sanitation. Sanitation-control measures are not merely cleaning procedures. They involve all procedures ensuring that a finished product will reach the consumer in the best possible condition. The guidelines cover physical plant requirements, cleaning procedures, operating procedures, and the need for personal hygiene.

SEA URCHINS

'Systematics of Sympatric Species in West Indian Spatangoids: Studies in Tropical Oceanography No. 7,' by Richard H. Chesher, Univ. of Miami Press, 1968, 168 pp., illus., $12.

Sea urchins have long excited the interest of zoologists and paleontologists. Spatangoid sea urchins are important links in the recycling of nutrients trapped in sediments and provide food for a great variety of marine life. They burrow in sand or mud, from just below low tide mark out to great depths. Marine fossil deposits often contain large numbers, but the burrowing habits that ensure their entombment also effectively protect them from the eyes and dredges of marine biologists.

Dr. Chesher's study deals with ten species and subspecies belonging to four genera. Three of the species are new to science. Each species is described, measured, and mathematically analyzed in detail, establishing on a firm basis the systematics and biology of this previously poorly known group.

The book should prove invaluable to marine biologists and ecologists, to those interested in the biology and evolution of echinoderms, and to museum workers concerned with accurate identification of species.

VENEZUELA

'The Present Status of the Sardine and Tuna Fisheries of Venezuela,' by Raymond C. Griffiths and John G. Simpson, FAO Fisheries Research and Development Project, Caracas, 1968. (Reprinted from 'Proc. of Gulf and Crib. Fish. Inst.,' Nov. 1967, pp. 159-177, illus.)

In contrast to the relatively primitive sardine fishery, the tuna fishery is one of the more advanced in Venezuela. This report briefly describes each fishery showing the catch, fishing effort, and the relation between them. Specific components of the catch, seasonal migrations, dependence of school size on population density and new fishing methods are discussed.

Griffiths and Simpson also consider the possible difference between the two main fishing areas and the migrations of fish between them, the effects of upwelling, and the low radius of action of the fleet.

CHROMATOGRAPHY

'Quantitative Thin-Layer Chromatography of Chlorophylls and Carotenoids from Marine Algae,' by S. W. Jeffrey, CSIRO, Australia, (Reprinted from 'Biochim. Biophys. Acta.,' Vol. 162, No. 2, pp. 271-285, Aug. 1968.)

A quantitative chromatographic method for determining microgram quantities of chlorophylls and carotenoids in planktonic marine algae has long been needed. This is a report on a chromatographic method that separates each pigment fraction for quantitative analyses and that can also be used to test the validity of spectrophotometric equations used for chlorophyll analyses in marine algae and in higher plants. Mr. Jeffrey describes the preparation and properties of the sucrose thin-layer plate, the quantitative procedures used, and some applications of method.

--Barbara Lundy

INTERNATIONAL

International Fisheries Survey Off California Underway

Research vessels of BCF, the Scripps Institution of Oceanography (La Jolla, Calif.), and the Far Eastern Seas Fisheries Research Institute of the USSR are cooperating in an international fisheries survey off California. The survey began in February 1969 and will end this month.

Its purpose is to assess the populations of Pacific hake, a species heavily fished by Soviet fleets in recent years. The U.S. recognizes hake as a valuable raw material for fish protein concentrate (FPC). The information is required to provide the scientific basis for agreements to protect the resource.

The Vessels

Participating vessels are the 'Miller Freeman,' operated by the BCF Laboratory in Seattle, Wash., 'David Starr Jordan' of the BCF Fishery-Oceanography Center at La Jolla, the 'Alexander Agassiz' from Scripps, and 'Professor Deryugin,' based at the Soviet agency's Vladivostok Laboratory.

Dr. Alan R. Longhurst, Director of the BCF Laboratory at La Jolla, is U.S. coordinator. Dr. Y. U. Yermakov, a fishery biologist with wide experience in this area, is chief scientist aboard Professor Deryugin. The vessel was scheduled to arrive at the Port of Los Angeles early in March to take on scientific sampling gear and for discussions with U.S. scientists.

All 4 vessels are equipped with the latest scientific gear for fisheries research.

The Hake Resource

In early spring, most of the adult Pacific hake population from British Columbia to Mexico gather off southern California and Baja California to breed. Eggs and young float in the water and are easily captured in plankton and counted. This "census" provides the basis for an estimate of the abundance of adult fish.

In past years, research vessels from the Fishery-Oceanography Center and Scripps have used this method to gather preliminary data on Pacific hake. However, the 2 institutions were never able to cover an area large enough to obtain definitive results. With 4 ships, the scientists will be able to survey quickly a much larger area than ever before. They will obtain more accurate estimates of the total hake population. The information is necessary to conserve and manage the resource.

In recent years, representatives of the two countries have alternated visits. They have met about twice a year to exchange scientific data from survey and research work in the preceding year on species of mutual concern, such as hake and Pacific ocean perch. They also discussed the apparent effect of the year's fishery on these species. The information developed formed the basis of discussions in working out fishing agreements aimed at protecting these fishery resources.

At the most recent meeting, held in November 1968 in Moscow, the scientists recommended a joint attempt to determine the size of the Pacific hake population--and plans for the survey developed from that suggestion.

Japanese Exploratory Fishing Off Chile

The government research vessel 'Kaiyo Maru' (3,200 gross tons) left Japan Nov. 1, 1968, on a survey cruise to the west coast of South America. On Jan. 10, 1969, she was trawling around 25° S. latitude and 74° W. longitude off Chile, taking merluza (hake), mackerel, and sharks. She has not found any sizable concentration of bottomfish--primary objective of the expedition. ('Shin Suisan Shimbun Sokuho,' Jan. 14, 1969.)

Longliner Finds Big-Eyed Tuna

In May 1968, the longliner 'Azuma Maru No. 31' (340 gross tons) began exploring off Chile on a government-subsidized tuna survey. She now has concluded operations. Her primary objective was to develop new southern bluefin grounds, but results were disappointing--only 10 bluefin were taken. However, the survey did locate big-eyed tuna

schools of sufficient density to support commercial operations. Azuma Maru No. 31 caught 252 tons of fish--big-eyed, 145 tons; albacore, 41 tons; and other fish, including southern bluefin, 66 tons. ('Katsuo-maguro Tsushin,' Jan. 20, 1969.)

Japanese Seek More Joint Shrimp Ventures in Indonesia

Following Toho Suisan Fishing Co.'s establishment of a joint fishery enterprise in Indonesia in late 1968, several major Japanese fishing and trading firms are seeking similar fishing ventures. Among others, Toyo Menka, Nihon Kinkai Hogei, Taiyo, and Nihon Suisan are arranging to join Indonesian interests in large-scale fishing ventures. Most plans involve shrimp fishing and, if all the proposed enterprises materialize, some Japanese foresee the possibility of an oversupply in Japan.

Japanese Firms Already Licensed

Toyo Menka, a large trading firm, is exploring for Indonesian shrimp with the Kyokuyo Hogei Fishing Co. The 2 firms plan to establish the largest Japanese fishing enterprise there, employing 200 fishing vessels. Nihon Kinkai Hogei plans to join the Indonesian Eramina (phonetic) Distant-Water Fishing Co. to establish a US$1 million company to fish shrimp off northeast Kalimantan. The Indonesian government has already granted a license, and trial fishing should start soon. Taiyo and Nihon Suisan have applied for a license to fish shrimp off West Irian's southern coast.

UN/FAO Financial Backing

The U.S. Food and Agriculture Organization (FAO) is offering a US$1 million loan for joint development of Indonesian fisheries. It has invited fishing firms in Japan and other countries to participate. Several Japanese firms have submitted plans which FAO is studying.

Shrimp Fishery Ripe for Development

Indonesian waters, with numerous scattered islands and bays, are ideally suited to shrimp propagation. The environment promotes rapid growth of such species as tiger, banana, and white shrimp. Indonesia is said to consider promotion of shrimp and other fisheries vital to its economic development. It welcomes Japanese assistance to local fishermen. This is why so many Japanese firms are planning joint enterprises there. However, since the government has 'sliced' the surrounding waters into small areas in issuing fishing licenses, there is concern about the successful operation of new ventures. ('Nihon Keizai Shimbun,' Jan. 22, 1969.)

Canada to Host Fishery Products Inspection Conference

Consumer protection will be strengthened by an international technical conference on fish inspection and quality control to be held in Halifax, Nova Scotia, Canada, July 15-25, 1969. It is sponsored by the Food and Agriculture Organization (FAO) of the United Nations. It is open to all FAO members and associates. Cooperating U.S. agencies include the Departments of State; Health, Education, and Welfare; Defense; and Interior.

Main Objectives

The main objectives are to consider all aspects of fish inspection--including staff organization and training, quality control, new inspection techniques, and new approaches to quality assessment. Fish-inspection methods in various segments of the industry will be compared. Techniques and methods sufficiently accepted to have possible use internationally will be emphasized.

FAO has said that the growing international trade in fishery products and other foods points up need for international standards. Waste and quality degradation often may be avoided by advice from trained inspection personnel who can pinpoint problems and correct them.

A Technical Conference

The conference will be conducted in English, French, and Spanish, the official FAO languages. Simultaneous interpretation will

be provided. Scientific papers will be accepted in any official language and be reproduced in that language with abstracts in the other two.

Because it is a technical conference, governments have been invited to nominate experts. FAO has recommended that participants come from Federal and State fish-inspection agencies, public and private research institutions, and the fishing industry. Other specialists who want to attend as individuals must arrange it in their own countries.

U.S. residents who wish to attend should request registration forms and information from Joseph W. Slavin, Assistant Director for Utilization and Engineering, Bureau of Commercial Fisheries, U.S. Department of the Interior, Washington, D. C. 20240.

East Germany Delivers Stern Trawler to Cuba

On Jan. 10, 1969, East Germany turned over to Cuba the large stern freezer trawler 'Playa Giron.' The vessel was accepted from the Stralsund People's Shipyards by H. Rodriguez, the Cuban Ambassador to East Germany.

The Vessel

'Playa Giron,' 3,200 gross tons, is 82.2 meters (269.6 ft.) long; her engines generate 2,630 hp. and she can make 13.6 knots. Her maximum processing capacity is 80 metric tons of fish a day. She can freeze 50 metric tons of fish a day and transport 1,450 tons of finished products.

Playa Giron is the first Cuban fishing vessel of this size. Four more are on order in East Germany.

Cuban Fishing Vessel Seized by Venezuela

The Cuban longliner 'Alecrin' was shot up and seized on Nov. 20, 1968, by 2 Venezuelan warships off Los Testigos Islands, 50 miles north of Venezuela. Cuba bought the 575-gross-ton vessel and 19 other tuna vessels from Spain in 1966. The Alecrin was carrying a crew of 38, including a Japanese instructor who has been working with the Cuban fleet for 2 years.

Venezuela reported to the United Nations that the Alecrin was 8 miles northeast of Los Testigos Islands, inside 12-mile territorial waters, when spotted by the 2 warships. Ordered to stop and identify herself, the vessel attempted to escape. Warning shots fired across her bow were ignored. The warships opened fire and forced Alecrin to stop. The Cuban vessel was boarded and taken to Carupano for inspection. The vessel was damaged, but no one was hurt.

Since Cuba has been committing illegal acts of direct intervention and subversion against Venezuela for years, Venezuela is vigilantly patrolling her territorial waters.

Cuba's Strong Reaction

Cuba reacted angrily. She placed the Alecrin considerably north of Los Testigos, in international waters. Cuba claims there were 5 other Cuban tuna boats in the area, that Alecrin had been fishing there 51 days and was carrying 90 tons of fish in her refrigerated holds. Cuba protested strongly to the Swiss representative, who cares for Venezuelan interests in Havana, and with UN. The seizure was called piracy.

No Sabotage Mission

Venezuelan investigation failed to produce evidence that Alecrin was engaged in a sabotage mission. On Dec. 13, 1968, the President of Venezuela personally ordered the vessel released. She sailed for Cuba on Dec. 20, one month after her seizure. Two of her crew requested asylum in Venezuela.

As an aftermath of the Alecrin incident, the Cuban government charged Venezuela's government-owned airline $31,500 for the return of a DC-9 jetliner hijacked to Cuba on Feb. 11, 1969. The charge is considered a reprisal for the Alecrin seizure. ("The Washington Post," Feb. 18, 1969.)

FOREIGN

CANADA

LOBSTER VESSELS WILL BE LICENSED

In a move to raise lobster fishermen's earnings, an upper limit has been placed on the number of boats licensed to fish lobsters in the Maritime Provinces in 1969 and future years. Licenses will be issued only for boats registered with the Federal Department of Fisheries to fish lobsters in Maritime waters in 1968. The only additional lobster boats that may enter the fishery this year are those that were under construction, or under contract for construction, prior to Jan. 20, 1969. The lobster license stays with the boat. When an owner sells his boat to another fisherman, he withdraws from the fishery and the buyer will be able to enter it.

Trap Limits

The lobster fishery is based on a resource that is fully exploited already and whose future growth is limited by biological factors. With such a limited quantity available, the number of fishermen is excessive and their capital and operating costs are extremely high. The result is generally low incomes. In the past several years, several measures have been introduced to reduce fishermen's capital and operating costs and to limit entry into the Maritimes lobster fishery. First came limitations on number of traps that could be fished by an individual. There will be no increase in lobster trap limits for the 1969 season.

In 1967, in a number of districts, licenses were issued only to those fishermen who had held licenses in these districts in 1966. In 1968 this was extended to all the Maritimes. This new system of issuing licenses in 1969 only to those registered in 1968 is an effort to improve the economy of the lobster fishery. In the future, licenses will be issued to new boats only if they replace old boats whose licenses will be canceled.

The effectiveness of placing an upper limit on the size of the fleet harvesting the lobster crop will continue to be studied to determine if further measures are required, for example, reducing the number of boats. This could be done by having the Federal government buy licensed lobster boats when they are offered for sale.

Registration Fees

Registration fees for lobster fishing boats are being increased from C$3 to $5. Each boat operator must have a $2 personal lobster fishing license; helpers on the boat will neither require a license nor pay any fee. There are about 10,000 lobster fishing vessels and 23,000 lobster fishermen in the Maritime Provinces. The annual landed value of lobsters in the region is about C$25,000,000. (Canadian Dept. of Fisheries, Jan. 20, 1969.)

* * *

TO ESTABLISH FRESHWATER FISH MARKETING CORPORATION

Canada soon should have a new Freshwater Fish Marketing Corporation to market fish, to increase returns to fishermen, and to promote international markets. Final passage of a Bill creating such an agency was expected early in 1969. Canada's freshwater catch is about 120 million pounds; about half is exported, almost entirely to the U.S.

Corporation's Powers

The Corporation will have the power to enforce minimum prices and other conditions of sale on exports, and to set minimum quality standards. The Bill empowers the Corporation to: (1) buy fish and prepare it for market, (2) buy, manufacture, or produce fish products or byproducts for market, (3) store, ship, insure, import, export, market, or otherwise dispose of all fishery products in its possession, (4) purchase, lease, or otherwise acquire real property, (5) establish branches throughout Canada, (6) invest in securities issued or guaranteed by the Canadian Government, (7) borrow money from any bank upon credit of Corporation, and (8) make loans of working capital, on a seasonal basis, to persons fishing for commercial purposes in a participating province. A participating province is one which has entered into an agreement with the Federal government to share

Canada (Contd.):

in the expenses of establishing the Corporation and to assist in its operation. The new agency will be headquartered in Winnipeg. (U.S. Embassy, Ottawa, Jan. 7, 1969, and Bill C-148.)

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NO. 2 SEAFOOD FIRM ISSUES 1968 ANNUAL REPORT

The 1968 annual report of National Sea Products Ltd., headquarters in Halifax, shows considerable improvement over 1967. The firm is generally considered Canada's second largest seafood producer, after British Columbia Packers.

Operating profit in 1968 was C$968,656, compared to a loss of C$73,413 in 1967 and a profit of C$2,158,152 in 1966. Nevertheless, the report notes, "The year's results, while better than 1967, cannot be considered satisfactory." Expenses showed a climb of 10 percent over 1967.

"United States market prices for groundfish fillets and blocks, particularly cod and perch, were below the cost of production during the year and there are few signs of these prices strengthening in the immediate future."

Shellfish Marketed Aggressively

"Our improved results over last year largely came about by more aggressive marketing of shellfish, specialty items, and byproducts. We shall continue to put increased emphasis on these lines as well as the development of new products, both in Canada and the United States."

Trawlers Built

In 1968, the program to add new trawlers was completed. Slightly over C$3 million was spent for this purpose during 1968. There are no plans for more vessel building. The company is facing a shortage of experienced trawler captains and fishing crews.

Company experience suggests that Atlantic queen crab production is more efficient with smaller boats than with converted trawlers. (U.S. Consul, Halifax, Jan. 6, 1969.)

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BRITISH COLUMBIA FISHERMEN LAND RECORD SALMON CATCH

Commercial salmon fishermen in British Columbia landed a record 180 million pounds in 1968, about C$44.5 million ex-vessel--C$6 million more than in 1966, the previous high. The total value of all fish landed in British Columbia in 1968 was C$56 million--nearly C$7 million more than 1967, but 9% less than 1966.

Value by Types of Vessels

All salmon fishermen enjoyed good catches. Returns to the gill-net fleet were particularly high. Landings by salmon gillnetters were valued at C$20 million, 40% higher than the previous record in 1958. The value of salmon reported by salmon seiners, nearly C$13 million, was C$3½ million higher than in 1967, but second to C$15.6 million received in 1958. Landings by trollers were valued at about C$12 million, slightly above 1967 but down from the 1966 record of C$13.9 million.

Salmon Species

Sockeye salmon were the most important in value in 1968--41 million pounds worth C$15½ million ex-vessel. Coho landings of 29 million pounds were worth C$10½ million. Pink--54 million pounds--had a landed value of C$6.8 million. Spring salmon landings were more than 13 million pounds, worth close to C$7 million. Chum salmon increased to 36 million pounds, the highest since 1958, worth nearly C$5 million.

Halibut and Herring

Halibut landings--28 million pounds valued at C$7.1 million--were up about 10% from 1967. Ex-vessel prices averaged around 25 cents a pound, unchanged from 1967. Due to the low level of herring stocks, the reduction fishery was closed in 1968. Production, limited to bait and experimental fishing, had a value of only C$160,000. Normally landings are worth between C$4 and 6½ million. Landings of grey and ling cod, sole, and other groundfish, valued at C$1.8 million, were up 10% over 1967. Landings of most species of shellfish were down from 1967, although the shrimp catch rose slightly. Wholesale value of 1968's catch was expected to exceed C$110 million. ("Fisheries News," Canadian Dept. of Fisheries, Dec. 30, 1968.)

EUROPE

Denmark

CONCERN OVER EUROPEAN COMMON FISHERIES POLICY EASED

A Danish delegation met with representatives of the European Communities' Commission (EC), the new name of the European Economic Community (EEC), during mid-Dec. 1968 to seek reconsideration of the proposed Common Fisheries Policy. This provides for licensing of fresh fish imports and requires surety deposits. More than three-fourths of Danish annual exports to the European Communities (US$46.7 million) is fresh fish.

Danish Fear

Denmark feared the proposed requirement that importers post a surety bond to obtain import licenses would obstruct free trade. The Danes hoped to obtain clarification of the import provisions. The EC representatives promised that those provisions would be significantly eased in the final proposal; also; in practice, the provisions would be flexibly enforced to avoid hampering trade with nonmember countries. Indications were given that "import certificates" would continue to be required for fresh fish--but the surety bond provision would be liberalized.

Export Price System

The "reference price" import-control system was also discussed. The EC representatives commented favorably on the new Danish minimum export price system on herring. They called it a "good adjustment" to the Common Market system.

Denmark is the major nonmember supplier of fish to the Common Market countries. As a group, the six countries constitute Denmark's best customer for fish and fish products. So Denmark has a major interest in the proposals for the EC Common Fisheries Policy. (U.S. Embassy, Copenhagen, Dec. 30, 1968.)

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FAROESE EXPORTS OF FISHERY PRODUCTS DECLINED IN 1968

In 1968, Faroese fishery products exports totaled \$12.1 million, compared with \$14.1 million in 1967. Salt fish exports to Spain and Italy, primary Faroese salt fish markets, declined. The declines were caused by overproduction in a number of salt fish producing countries. The Faroese exported only 8,200 tons of salt fish to Italy in 1968, compared with 13,500 tons in 1967. Salt-fish exports to Spain amounted to 7,200 tons in 1968, 8,400 tons in 1967. However, Greece took 3,000 tons in 1968--2,000 tons more than in 1967. Faroese salt-fish production was 27,000 tons in 1968, and 30,000 tons in 1967.

Poor Fishing in 1967-68

In 1968, lower prices on world markets for major Faroese fishery products also contributed to the lower total value. A large part of the fishing fleet is in financial difficulty, because of increasing costs of operation and poor fishing during the last 2 years. (U.S. Embassy, Copenhagen, Jan. 21, 1969.)

* * *

FAROESE FISHERMEN MAY STRIKE

Conflict between fishermen and vessel owners on the Faroe Islands has idled 80% of the fleet. Negotiations, broken off in December 1968, were resumed on January 17, 1969. A strike has not been formally declared but is considered imminent. A total strike would include North Sea herring vessels and freezer vessels now docked in British harbors, as yet not involved. The conflict concerns fishermen's demands for higher minimum wages, price supports, and a greater share of the catch.

Legislature Seeking Solution

The Faroese legislature, called into session on Jan. 8 to consider the case, has not yet solved it, probably because the two controlling political parties have not agreed on a solution. However, informed sources say that settlement may be expected shortly. (U.S. Embassy, Copenhagen, Jan. 21, 1969.)

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Denmark (Contd.):

ADVERTISES FOR
NORWEGIAN FISHERMEN

The fishermen's association of Esbjerg, Denmark, has sent bulletins to a number of places in north Norway urging qualified unemployed fishermen to come to Denmark for work on Danish cutters fishing the North Sea. Esbjerg alone needs 100 crewmen and would welcome them. The Norwegians would have the same social rights and privileges as Danish citizens.

N. Norway Fishing Poor

Fishing has been extremely poor in northern Norway during the past year. Many residents there are having severe economic problems. The Esbjerg association has received the first inquiry and more are expected. (U.S. Embassy, Copenhagen, Jan. 21, 1969.)

USSR

RESEARCH CONDUCTED ON
PACIFIC OCEAN PERCH

During the past few years, scientists of the Soviet Pacific Scientific Research Institute for Fisheries and Oceanography (TINRO) have conducted extensive and systematic studies of fishery stocks of the Pacific Northwest and California. In November 1968, some preliminary results of studies on northeast Pacific ocean perch were published in "Rybnoe Khoziaistvo," the Soviet Ministry of Fisheries periodical.

The author, TINRO scientist V.A. Snytko, reports that Pacific ocean perch (Sebastodes alutus) occurs between 48° and 51° N., off Vancouver Island, and between 43° and 46° N. In the Vancouver-Oregon area, the densest concentrations occur in summer and autumn, between 150 and 300 meters. With decreasing water temperature, the fish migrate to greater depths, wintering in small dense schools in canyons and troughs, where they are less accessible to fishing.

Fish Sizes

Pacific perch caught in the area are from 15 to 54 cm. long, weigh from 55 grams to 2 kg., and are 3 to 26 or more years old. Catches are mostly fish from 31 to 43 cm. long and from 10 to 14 years old. The perch in the Eastern Pacific are larger than in the Bering Sea or the Gulf of Alaska.

Perch Stocks Biology

In the Vancouver-Oregon area, the biology of perch stocks is similar in many respects to their biology in other areas. Growth is fast during the first 2-3 years of life, then slows. After the 13th year, annual growth rate is less than 1 cm. Mass hatching of larvae in the Vancouver-Oregon area occurs in February-March at 250-400 meters, with water temperatures of 6-8° C. In the Bering Sea and the Gulf of Alaska, the hatching occurs in March-April and April-May, respectively.

Migration

Feeding migration in the Vancouver-Oregon area lasts from spring to late autumn, when daily vertical migrations are clearly marked, except on cloudy days and during new moon. Perch migrate an average of 30-40 miles, depending on the steepness of the continental slope.

* * *

RESEARCH VESSEL BEGINS 44th CRUISE

In late Nov. 1968, the 'Vitiaz,' oceanographic research vessel of the Soviet Academy of Sciences, left Vladivostok on her 44th scientific cruise. She was scheduled to spend $3\frac{1}{2}$ months in the tropical Pacific, visiting the Coral Sea, the Solomon Islands, the Gilbert Islands, New Caledonia, and New Hebrides. Her first scientific station was at Tarawa Atoll in the Gilberts. In early January 1969, the Vitiaz called at Noumea, New Caledonia, after conducting research on the biological productivity of the ocean. From there, she was to go to Malekula Island in the New Hebrides, to the Coral Sea, and then to Australia's Great Barrier Reef.

Purpose of Voyage

The principal purpose is to find methods to increase productivity of the oceans. Soviet scientists believe the world's annual maximum sustainable yield for marine fisheries can reach 100 million metric tons. Total world marine catch was 50.6 million tons in 1966 and 53.9 million in 1967.

USSR (Contd.):

The Soviet scientists will perform biological research and gather data necessary to design a mathematical model for the fishery resources in the Pacific's upper layers.

Scientific Personnel

The expedition is headed by M. E. Vinogradov, Deputy Director of the Oceanology Institute of the Soviet Academy of Sciences. Sixty scientists from Soviet marine research institutes are participating.

In mid-May 1968, Vitiaz returned from a 4-month scientific cruise, her 43rd, covering most of the Central Pacific.

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AIRLIFT FUR SEALS FROM SAKHALIN TO BATUMI

In August 1967, 6 Kamchatka fur seals, caught on Tyulenii Island, off Sakhalin, were transported by tug, truck, and aircraft to an aquarium at Batumi on the Black Sea. The seals, both male and female, were 2 years old or less.

Methods of Transport

They were carried in 110x65x65 cm. wooden cages weighing 41 kilograms (kg.) including the 10-kg. drip pan. From Tyulenii, the seals were brought by tug to Sakhalin Island, and washed in sea water with about 200 kg. of ice packed around the cages. The seals were trucked to Yuzhno-Sakhalinsk airport, loaded on an IL-18 aircraft and flown to Adler on the Black Sea. In Adler, they were transferred to another aircraft for the flight to Batumi.

Washed Again

Stopovers were made in Khabarovsk on the shore of the Sea of Okhotsk and Novosibirsk. In Khabarovsk they were washed again, this time with fresh water. Then 200 kg. of ice again were packed around the cages, but only along the sides because the seals appeared to be cold when ice also covered the tops. Air temperature was kept at 10-24° C. during the flight. The seals slept the entire time, both aloft and on the ground during stopovers.

Life at Batumi

At Batumi the animals were placed in 70-cubic-meter capacity oval tanks filled with water from the Black Sea. The seals, now permanent house guests at the aquarium, are very popular with visitors. ('Rybnoe Khoziaistvo,' Nov. 1968.)

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PRODUCES FULL-LENGTH FILM ON OCEANS

A Soviet documentary and scientific film studio has begun shooting a full-length color film titled 'Planet Ocean' ('Planeta Okean'). It will be a combination fiction-documentary depicting problems met in studying and exploiting deep-sea resources. Filming began in summer 1968 in the Black Sea off Sevastopol and will continue in the Far East off Kamchatka and the Kurils. ('Sovetskaia Rossiia,' Dec. 28, 1968.)

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DEVELOPS NEW FISH-PROCESSING EQUIPMENT FOR USE AT SEA

The Soviet fishing industry has developed 4 new fish-processing plants to be used aboard BMRT-class large factory stern trawlers. The plants include head-cutting, scaling, filleting, and fillet-pressing machines. Three of the plants were tested successfully aboard the BMRTs 'Sapfir' and 'Kol'tsov,' in the central and southwestern Atlantic. With the new plants, up to 15 men per vessel can be shifted to other duties, saving about 38,000 rubles (US$42,180) in operation costs per vessel annually.

Fillet-Pressing Machine

The fourth plant is a fillet-pressing machine. It removes air and moisture from fish fillets, compressing them into small compact blocks. As a result, 15% more blocks can be stored in stern factory trawler holds, freezing time of smaller fillet blocks can be reduced by 20%, and consumption of packaging materials by 10%.

Fish-Meal Grinding Plant

The Far Eastern Fisheries Administration has tested a mechanized fish-meal grinding

USSR (Contd.):

plant that grinds coarse fish meal into a finished product. The first operational tests successfully produced 85 tons of finely ground fish meal. The equipment now will be installed aboard Far Eastern BMRTs. ('Rybnoe Khoziaistvo,' No. 9, 1968.)

East Germany

SHIPYARDS CAN BUILD 5,000 TONS OF FISHING VESSELS A MONTH

Total capacity of East German shipyards for fishing vessel construction is in excess of 5,000 gross tons a month. Three East German shipyards built 14 fishing vessels totaling 15,650 gross tons during Jan.-Mar. 1968. Most of them went to the Soviet Union, including 5 'Atlantik' class vessels, 2,650 gross tons each. Only 1 trawler, 1,000 gross tons, was delivered to the East German fishing industry. Six small cutters, about 200 gross tons each, were built for Denmark and Sweden.

* * *

TO TEST FIRST UNDERWATER LAB

East Germany's first undersea 'laboratory' is being readied for submersion in the freshwater reservoir near Dippoldiswalde. Designed and built by amateurs, it is a steel cylinder 4.2 meters (13.8 feet) long, 1.8 meters (5.9 feet) in diameter, and weighs 14 metric tons. Two divers will be lowered to 10 meters (32.8 feet) for 2 days in the first experiment. Air and oxygen will be supplied from shore.

Poles Experiment Too

The announcement of this modest experiment follows by only a few weeks a similar, more advanced, experiment in Poland. The Polish news media gave it wide coverage. In the Polish experiment, 3 aquanauts spent 7 days at 24 meters (78.7 feet) in the Baltic.

Iceland

PERMITS TRAWLING WITHIN FISHERY LIMITS

The Icelandic Parliament passed a law on Dec. 19, 1968, permitting Icelandic fishing boats up to 200 GRT to trawl in certain areas north and south of Iceland during Jan. 1-Apr. 30, 1969. This action was taken while awaiting recommendations of a parliament-appointed committee for more permanent legislation expected in late January or early February 1969.

Besides temporary exceptions provided by Icelandic-U.K. agreement 10 years ago, this is the first trawling to be permitted since establishment of the fishery limits in 1958. Icthyologists believe such operations are possible without any serious damage to sea resources. Nevertheless, relaxation of the prohibition against trawling within the limits has been long in coming because of strong public emotions.

Government's Case

The Government is aware of international sensitivity about fishery limits. It claims that the new law is a direct continuation of one of Iceland's main arguments for extending the limits--that Iceland wishes to use the fishing grounds within the limits for its optimum economic advantage, and that the fisheries will be restricted and conducted under scientific control.

There has been widespread approval of the law. However, small hand-line fishermen have registered some apprehension that their fishing grounds might be destroyed. The owners of larger trawlers than 200 GRT have expressed a desire to be allowed also to operate within the limits. (U.S. Embassy, Reykjavik, Jan. 2, 1969.)

Sweden

RADIOTELEPHONE FISHING ANNOUNCEMENTS MAY BE CODED

Fishermen of Sweden's Baltic coast are considering either coding their radiotelephone announcements about good fishing or stopping them completely. Nearly every time

Sweden (Contd.):

they locate good fishing and radio their colleagues, vessels from Poland, East Germany, and the USSR soon appear and virtually fish out the schools in the area. The Swedes suspect that the other countries maintain a receiver especially for these transmissions. One trawler skipper said that announcements of good fishing at certain locations quickly produce a "forest of masts on the horizon." (U.S. Embassy, Copenhagen, Jan. 21, 1969.)

Spain

ATTEMPTS TO CONCENTRATE FISH-PACKING INDUSTRY

Spain is trying to spur concentration of the fish-packing industry. An official decree of Dec. 1968 offers preference in obtaining official credit to build new consolidated fish-packing plants meeting specified technical standards. The decree includes the benefits the government already has offered for general industrial consolidation. The government was to accept construction applications under the decree for 3 months.

Concentration of enterprises in this industry may generate an increased demand for larger and more modern packing machinery. So the decree should interest U.S. food-packing equipment exporters.

Concentration to Help Exports

The present fish-packing industry is about 500 small firms. This lack of centralized organization, as in other parts of the food-packing industry, often results in poor quality control and a lack of standardization, weakening export marketing efforts. Despite these weaknesses, Spain exported about US$10 million worth of canned fish in the first eight months of 1968. The Ministry of Industry expects that a concentration of firms will increase this already-high export volume. (U.S. Embassy, Madrid, Jan. 21, 1969.)

France

NEW TUNA SEINER MAY FISH YELLOWFIN IN EASTERN PACIFIC

France may join the nations fishing yellowfin tuna in the eastern tropical Pacific when the 176-foot seiner 'Biscaya,' launched in fall 1968, is commissioned in Bayonne, France.

U.S. tuna fishermen may know her sisterships: the 'City of Tacoma,' the 'Blue Pacific,' and 'Jeanette C.'

When completed, the French vessel, manned by French Basques, probably will fish in the Atlantic and Pacific. She will deliver her catches to the cold-storage plant and canneries in Saint Jean de Luz.

Experienced Owners

The Biscaya's owners are experienced in the tuna fishing industry of France. Their firm, Luz Armement, also owns 2 other tuna purse seiners, both built on French designs.

Skippers of the Biscaya and the other 2 vessels spent time on U.S. tuna purse seiners learning fishing methods.

Biscaya has an 800-ton capacity and should be as efficient as her sisterships from Tacoma, Wash.

France Not IATTC Member

France is not a member of the Inter-American Tropical Tuna Commission and will not be bound by the yellowfin quota in the Eastern Tropical Pacific. Yugoslavia, Japan, and possibly Cuba are other non-IATTC members fishing in that area. ('National Fisherman,' Jan. 1969, and other sources.)

* * *

CRISES IN COD FISHERIES

Trawler fleet fishermen are threatening a partial production strike unless the government aids them. The fleet, operating on the banks off Newfoundland, has an annual cod production of 56,000 tons; 20,000 tons of that are exported. Production, salted or frozen, is valued at US$30 million.

France (Contd.):

Skippers now are threatening to make only one trip to the banks this year instead of the customary three. Each trip lasts 3 months. The skippers say they can no longer compete with Spanish, Icelandic, and British operations because those countries devalued their currencies. As a result, cod prices have dropped from about $0.13 to $0.12 a pound for salted cod, and from $0.19 to $0.17 for frozen cod.

Need Modern Vessels

The real difficulty is that only 9 of the fleet's 31 trawlers are capable of freezing fish on the grounds. Vessel owners hope for government help through next season. This would give them time to negotiate with the Common Market's Agricultural Fund. They hope the fund will partially finance the purchase of 9 new trawlers if they agree not to demand a certain share of sales within the Common Market. The skippers claim to have an agreement in principal for support of this type so they can obtain new equipment before 1974. ('Vestkysten,' Dec. 4, 1968.)

OECD Issues Review of 1967 Fisheries

Various fishery developments in the North Atlantic, North Pacific, and Mediterranean are examined in a "Review of Fisheries in OECD Member Countries in 1967," published in early Dec. 1968. The Review was asked by the organization's Committee for Fisheries, whose members represent countries producing about half the world's fish supply and handling around 70% of the international trade in fish and fish products.

Although overall fish catch in northern waters was heavier in 1967 than in 1966, supplies for direct human consumption were lower. The more plentiful species were those used mainly in fish meal and oil manufacture. Cod catch in North Atlantic areas, the mainstay of a number of major fisheries in bordering nations, was smaller.

Mixed Picture

This supply situation and a widespread marketing recession for bulk fish resulted in lower returns to most fishing fleets. Coastal fisheries, producing a greater variety of high-quality fish for sale fresh in nearby markets, enjoyed reasonably good yields and fared better, on the whole.

The Review gives special attention to international outlets for products from the reduction industry (meal and oil) and cod fisheries (frozen and cured). In those markets, OECD countries are among the leading producers--Scandinavian countries, Canada, Japan--and consumers--U.S. and U.K.

Reduction Industry

As production of raw material for the reduction industry was at an all-time high, sales could only be effected at greatly reduced prices. This caused generally lower returns to fishermen and vessel owners; in a number of cases, operational stoppages. Certain fisheries with poor yields, such as Iceland's herring fisheries and the U.S. menhaden fisheries, were hit particularly hard.

Prices also were depressed in the North-East and North-West cod fisheries. These are important, not only to countries near the fishing grounds--Canada, Greenland, Iceland, Faroes, Norway--but also to all European distant-water fleets. The decline might have started with overstocking of blocks of frozen fillets for the U.S. fish stick and portion industry, subsequently spreading to other markets across the Atlantic. Thr frozen-fish market is being examined by the Committee.

More Government Aid

The fisheries of many nations suffered setbacks, often with serious consequences. This was true especially for Iceland, whose economy depends so heavily on fish exports. The adverse conditions stimulated national authorities to increase financial aid to their fishing industries. The Review concludes that "this could have adverse effects by distorting the normal conditions of the increasing competition between fishing countries."

Countries covered in the Review are: Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Turkey, the U.K., and the U.S. The publication is available from: OECD Publications Center, Suite 1305, 1750 Pennsylvania Ave. NW., Washington, D.C. 20006, at $2.30. (OECD Press Release, Dec. 2, 1968.)

LATIN AMERICA

Peru

1968 WAS BANNER YEAR FOR FISH MEAL PRODUCTION AND EXPORTS

The year 1968 set a record for Peruvian fish meal production and exports. (The season lasts from fall to spring, so any summary of a calendar year overlaps parts of two seasons.)

From Jan.-Dec. 1968, production totaled 1,921,900 metric tons; in 1967 it was 1,815,983.

Exports during 1968 reached 2,083,205 metric tons; in 1967, 1,560,900.

Partly due to lack of fish, fish meal production dropped significantly in November. December production was lowest in 1968, except during closed season. Fishing during the first two weeks of December was concentrated around Chimbote, although fishing farther south picked up during the third week.

Closed Season Set

On Jan. 9, 1969, the Government announced a closed season (veda) during Feb. 1-Mar. 2, and a provisional limit on the 1968-69 anchoveta catch of 8.2 million metric tons. Fishing during the veda may continue out of Ilo in southern Peru. (Sociedad Nacional de Pesqueria.)

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1968 FISH MEAL EXPORTS

Peru exported 2,083,205 metric tons of fish meal in calendar year 1968; more than half went to only 3 countries: The U.S. was the largest single buyer with 550,413 tons. West Germany was second with 396,853 tons, followed by the Netherlands with 201,482.

7 Countries Took More Than 40,000 Tons Each

Spain imported 110,979 tons and Italy 102,420. Japan ranked sixth with 97,578 tons, Mexico took 84,909, and East Germany placed 8th with 81,005. Poland imported 68,866 tons, Yugoslavia 52,965, and Czechoslovakia 43,680.

Countries Importing Less Than 35,000 Tons

Venezuela, the U.K., and Belgium each imported more than 30,000 but less than 35,000 tons. Hungary, France, and the Philippines each took a little over 20,000 tons. Sweden and Singapore each imported over 15,000 tons, while Ireland, Taiwan, Finland, and South Korea took slightly more than 10,000 each.

Countries Importing Less Than 10,000 Tons

Argentina, Bulgaria, Brazil, Colombia, Israel, and Greece each imported less than 10,000 but more than 5,000 tons; El Salvador trailed with 2,408. All other importing countries combined took only 5,504 tons.

Brazil

FISHING INDUSTRY OUTLOOK

Brazil, potentially an important supplier of shrimp to the U.S., is offering very attractive incentives for fishing industry investments through 1972. Export industries provide the best opportunities for immediate returns.

Large untagged shrimp resources in both the north and south only now are beginning to be exploited by firms financed by U.S. and other foreign capital. Two new U.S.-financed firms, operating from Belem at the mouth of the Amazon, together plan to export to the U.S. over 4 million pounds of shrimp annually, or more than 3.5 times the total U.S. imports of Brazilian shrimp in 1968. Brazil's shrimp exports to the U.S. increased sharply in 1968, to a level almost 7 times that of 1967.

The Brazilian Government is expected to examine new investment projects with a more critical eye than previously. Projects generating export earnings should be favorably received.

Although vast improvements are needed to improve fish distribution in Brazil, investments, plus U.S. technology and management, might overcome some of the problems. Opportunities also exist for the sale of U.S. equipment that can solve or circumvent problems in the production-marketing chain.

Brazil (Contd.):

Legal Problem for American Firms

American firms with fisheries investments in Brazil, involved in a legal problem concerning interpretation of regulations on vessel registration, reportedly have not encountered unusual bureaucratic hurdles in other operations.

Catches of shrimp and catfish for export are increasing; the spiny lobster catch, almost all exported to the U.S., is levelling off after several years of sharp decline.

Brazilian Laws

The new Brazilian fishery development law is having an important impact. The Fisheries Ministry had approved projects totaling US$40 million through August 1968.

Brazilian law provides a tax rebate of US$0.10 a gallon on diesel fuel (current cost US$0.25 per gallon) used to produce goods for export. An agency to administer the program is expected to be established soon.

Areas of Development

- Several Brazilian organizations are planning to produce FPC.

- At least four institutions are training personnel for the fishing and fish processing industries, assuring a supply of trained labor.

Marketing Problems

- While the bulk of approved investment programs have concerned fish catching, marketing needs the greatest improvement. Currently, all fish has to be transported by truck, distribution facilities are antiquated, and fish sold in normal food channels costs more than meat.

Note: More details are available in Foreign Fisheries Leaflet 173, "Fishing Industry Outlook--Brazil," available on request from Joseph Pileggi, Chief, Branch of Foreign Fisheries, Department of the Interior, Room 8015, Washington, D. C. 20240.

Mexico

TO BUILD SALINA CRUZ FISHERY COMPLEX

A $12 million fisheries complex is to be built at Salina Cruz, Oxaca, far south of Mexico's Pacific coast. Complete details are not available, but the installation is to handle 20,000 metric tons of tuna and bonito annually, and can approximately 6,600 tons. Twenty-five percent is to be marketed domestically, the rest exported.

French Financing

The project will be financed from a US$35 million loan made subsequent to the French-Mexican protocol of 1967. French interests will pay 95%, Mexicans the rest. (U.S. Embassy, Mexico, Jan. 18, 1969.)

Trinidad and Tobago

PLANS FISHING COMPLEX

A multimillion-dollar fishing industry complex, including Caribbean Free Trade Association (CARIFTA) territories, is planned in Trinidad and Tobago's next Five-Year Development Program (1969-1974). The proposal is based, in principle, on recent OAS fishery development survey.

CARIFTA members are Antigua, Barbados, Guyana, Trinidad and Tobago, Dominica, Grenada, St. Kitts-Nevis-Anguilla, St. Lucia, St. Vincent, Jamaica, and Monserrat. British Honduras has applied for membership.

WHAT IS PLANNED

The US$7.1 million fisheries scheme calls for the purchase, installation, and operation of the entire project by a single company. The company would be responsible for:

1) A fleet of seiners and trawlers;

2) Support vessels to transfer catch and furnish ice, fuel, food, and all other requirements from fishing port to fishing grounds;

3) A special fishing harbor with cold-storages and facilities for manufacturing ice and dry ice;

Trinidad & Tobago (Contd.):

4) A maintenance shop for engines and fishing gear and a small shipyard for the fishing fleet;

5) A small factory to make and repair fishing nets;

6) A store for spare parts and fuel oil bunkers for local and visiting ships;

7) Processing facilities for canning, filleting, smoking, salting, and dehydrating fish; and for producing fish meal and fish protein concentrate;

8) Distribution centers in Trinidad and Tobago, and in other CARIFTA area territories, to market fresh, chilled, and frozen fish, emphasizing safe and sanitary distribution.

UN Help

United Nations Special Fund has set aside US$1.5 million to provide technical assistance for implementation of the project, and supervision during the first operational period.

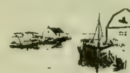
Plans to build a modern fishing port are included. Sea Lots, Point Lisas, and Chaguaramas are possible sites. A fisheries training school is to be established at the University of the West Indies to provide technological training.

It is not clear whether the government will run the proposed scheme entirely on its own initiative or invite local entrepreneurs to participate. Nevertheless, it is clear that Trinidad & Tobago has finally realized the importance of implementing and developing one of the country's richest and most viable economic assets. (U.S. Embassy, Port of Spain, Trinidad, Dec. 17, 1968.)

Guyana

FIRE RAZES OFFICES, DOCKS OF GEORGETOWN SEAFOODS

In Georgetown, Guyana, the downtown offices and docks of the U.S. shrimp trawler firm Georgetown Seafoods were razed by fire Jan. 1, 1969. The 15 trawlers berthed at the docks were removed to safety. Major installations of the company, several miles upriver from Georgetown, were not involved. (U.S. Embassy, Georgetown, Jan. 2, 1969.)



HOW MANY SPECIES OF FISHES ARE THERE?

Although fishes are the most numerous of the recent vertebrates, there is little agreement among scientists on the number of species. Estimates range from 15,000 to 40,000 species; however, 25,000 appears to be the most often quoted figure. This discrepancy exists because fish species are sometimes named more than once due to inadequate descriptions and variation due to environment or geographical distribution. In some fish species, the male has been described as belonging to one species and the female to another because of a difference in body form or color pattern. This phenomenon is called sexual dimorphism. Other fishes have been named more than once because the young look different than the adults. In addition, most scientists agree that not all fishes have yet been named; the estimate of 25,000 allows for this unknown. The species of fishes with bony skeletons are more numerous than those with skeletons of cartilage (sharks and rays). Bony fish number around 20,000 while the cartilaginous fish number only about 600. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

ASIA

Japan

FISHERIES BUDGET INCREASES IN FY 1969

The Japanese cabinet adopted the fiscal year 1969 (April 1969-March 1970) budget estimates for submission to the Diet (parliament). Estimates for the Fisheries Agency total about US$94.14 million, an increase of 16% over FY 1968 budget of $78.97 million.

The FY 1969 budget carries large increases for guidance and patrol in the coastal and high-seas fisheries, vessel construction, biological research for international fisheries, fishing industry disaster compensation, overseas fishery development, and fishing-port improvement projects. Funds newly authorized include $83,000 subsidization of private fishery surveys to promote the distant-water fisheries, and $53,000 for saury resource surveys off Japan. ('Nihon Suisan Shimbun,' Jan. 15, 1969.)

* * *

LONG-TERM OUTLOOK FOR MARINE PRODUCTS

The Japanese Fisheries Agency has released an interim report on the long-term outlook for demand and supply of marine products in Japan. The report, using 1966 as the base year, predicts Japan's demand for fishery products in 1977 will exceed 11.5 million metric tons, compared with 8.07 tons available in 1966. Domestic production is expected to increase to around 8.9 million tons in 1977, from 7.32 million tons (including whales) in 1966. Therefore, there is likely to be a supply shortage of over 2.6 million tons by 1977.

Increases in Imports and Production

Opinions among Japanese scientists and businessmen vary as to whether this deficiency can be met through imports or through increases in domestic production. The question concerning imports is whether the developing fish-exporting countries will be able to supply the deficiency--because, even in those countries, fish consumption is likely to increase with a rise in income. There also is a growing shortage of animal protein in many countries. As for increasing fish production in Japan, the problem is to solve the supply shortage, particularly of higher-valued fish and shellfish. The demand for these will continue to increase as income rises and diet improves.

Other Solutions Proposed

Some proposed solutions are: (1) promotion of fish breeding and cultivation, (2) development of coastal fisheries, (3) utilization of untapped bottomfish and other fishery resources, and (4) improvement of fishing and processing techniques. However, even implementing these proposals probably would not increase production by more than 1-2 million tons. Therefore, the demands created by rising income and population growth still can be expected to outstrip supply. ('Minato Shimbun' and 'Suisan Tsushin,' Dec. 1968.)

* * *

ALLOCATES NORTH PACIFIC WHALE QUOTA

On Dec. 26, 1968, the Japanese Fisheries Agency announced domestic allocation of the North Pacific baleen whale catch quota allotted to Japan for the 1969 season--886.5 blue-whale units (BWU). The quota was divided among 3 participating whaling firms: Taiyo and Nihon Suisan, 285.5 BWUs each; Kyokuyo Hogei, 315.5 BWUs.

Japan's Quota Cut

Catch limit on North Pacific baleen whales, set by the International Whaling Commission in June 1968, cut Japan's 1969 share by 114.5 BWUs from the 1,001 units authorized during the preceding 4 years. ('Suisan Tsushin,' Dec. 28, 1968.)

* * *

INVESTMENTS IN OVERSEAS FISHERIES

In Oct. 1968, there were Japanese capital investments in 38 overseas joint fisheries ventures. Thirty were active, 6 were temporarily inactive, and 2 had discontinued operations. Only 10 were making profits; the rest were losing money. The 10 distributing profits to shareholders in 1968 were:

Japan (Contd.):

	Date Established	Total Capital	Japanese Co.	Japan's Share	Business
		US$		%	
Australia (Papua)	June 1967	111,110	Kinkai Hogei	49	Shrimp trawling
Canada	July 1967	92,500	Taiyo Gyogyo	49.5	Whaling
Fiji Islands	Aug. 1964	756,670	Nichiryo Banno Tsusho	90	Cold storage
Hong Kong	May 1955	522,810	Nihon Suisan	3.3	Cold storage
India	April 1956	266,670	Taiyo Gyogyo	49	Cold storage
Malaysia (Malaya)	Aug. 1959	163,330	Overseas Fishery Co.	49	Cold storage, tuna fishing & packing
Malaysia (Sabah)	May 1964	194,250	North Borneo Fishery Co.	48	Shrimp trawling
Mauritius Island	Feb. 1967	47,920	Overseas Fishery Co.	36	Bottom trawling
Netherlands Antilles	May 1963	284,400	Nippon Reizo	100	Cold storage
Thailand	July 1966	35,420	Kyokuyo Hogei & Nomura Boeki	66.6	Cold storage

Source: 'Suisan Tsushin,' Jan. 11, 1969.

* * *

FROZEN TUNA EXPORTS ROSE IN 1968

Frozen tuna exports to the United States (excluding American Samoa) and Canada during Jan.-Dec. 1968 totaled 75,959 short tons valued at US$29,222,115--10,237 tons and $1.1 million over 1967. Exports to Europe and other countries in 1968 totaled 30,693 metric tons worth US$12,138,335, down 4,832 tons and $3.3 million from 1967. ('Suisancho Nippo,' Jan. 20, 1969.)

	Jan.-Dec. 1968		Jan.-Dec. 1967	
	Quantity	Value	Quantity	Value
	Short Tons	US$	Short Tons	US$
Exports to:				
United States & Canada1/:				
Direct exports from Japan	46,738	20,815,685	2/40,638	19,171,022
Atlantic and Indian Ocean Transshipments	29,221	8,406,430	25,084	8,921,644
Total	75,959	29,222,115	65,722	28,092,666
	Metric Tons		Metric Tons	
Europe and Other Countries:				
Italy	24,655	10,671,399	30,256	13,696,511
France	440	207,775	280	145,865
Spain	3,066	706,624	664	155,948
Ghana	1,766	250,610	831	107,799
Others	766	301,927	3,494	1,414,484
Total	30,693	12,138,335	35,525	15,520,607

1/Excludes deliveries to American Samoa.
2/Exports to Canada totaled 1,593 short tons in 1967.

* * *

SAURY CATCH HIT RECORD LOW IN 1968

The 1968 saury catch was 127,000 metric tons--over 80,000 tons less than the 215,000 tons in 1967. The sharp decline raised the season's average price to US$129 a short ton ($106 a ton in 1967) and resulted in an unprecedented bait shortage for tuna fishermen. Until 1963, Japanese saury landings averaged 400,000 tons a year, but during the following 4 years catches dropped to between 200,000 and 300,000 tons.

In view of the declining catch off Japan, the saury industry may seek new grounds in distant waters. ('Suisan Shuho,' Jan. 5, 1969.)

* * *

5 SEINERS LICENSED FOR EASTERN PACIFIC TUNA FISHERY

On Jan. 13, 1969, the Japanese Fisheries Agency announced it would license 5 purse seiners to operate in the Eastern Pacific in 1969:

Japan (Contd.):

Name of Vessel	Size	Owner
	Gross Tons	
'Hakuryu Maru No. 55'	499.57	Kawajiri Gyogyo Fishing Co.
'Gempuku Maru No. 82'	499.66	Toyo Gyogyo Fishing Co.
'Hayabusa Maru No. 3'	275.34	Taiyo Fishing Co.
'Nissho Maru'	252.93	Kinkai Hogei Fishing Co.
'Taikei Maru No. 23'	210.20	Ogata Gyogyo Fishing Co.

Agency's Position

The Agency indicated that for some time the issuance of licenses will be limited to 5 vessels because unrestricted licensing would raise strong opposition from longline operators, and antagonize foreign countries. The Agency also intends to take steps for Japan's admission into the Inter-American Tropical Tuna Commission in 1970, since purse-seine fishing naturally will increase Japan's yellowfin landings in the regulatory area. Japanese longline catches in the area have been around 3,000 tons annually.

Fishing Plans

The 5 seiners were expected to depart Japan in late January 1969. After closure of the yellowfin fishery in the regulatory area, 'Hakuryu Maru' and 'Gempuku Maru' are scheduled to move to the eastern Atlantic. The other 3 seiners either will fish in the southwest Pacific, or enter the seine fishery off Japan. ('Suisan Tsushin,' Jan. 16, 1969.)

* * *

FISHING FIRMS EXPLORE OFF U.S. EAST COAST

In 1967, Japanese fishing firms began investigating bottomfish resources in the western Atlantic to find alternate fishing grounds for the slow season off west Africa.

In Jan. 1969, the stern trawler 'Sekishu Maru' (997 gross tons), owned by a Nichiro-affiliated firm, fished off Florida. She took over 20 tons per operation, mostly butterfish. Another stern trawler, 'Kaimon Maru' (2,500 gross tons), owned by Nihon Suisan, was scheduled to begin fishing in late January.

Off Nova Scotia

The 2,500-ton stern trawler 'Shirane Maru' is off Nova Scotia on a government-subsidized resource survey cruise. Catches are averaging 10 tons of processed fish a day--60% deep-sea smelt and 40% rockfish, dressed and frozen aboard the vessel. 'Shirane Maru' is scheduled to continue operations until March 1969, then return to her base at Las Palmas, Canary Islands. ('Minato Shimbun,' Jan. 7 & 12, 1969.)

Singapore

NEW FISHERIES LAW TAKES EFFECT

Singapore's Fisheries Act, first introduced in 1966, became effective Jan. 1, 1969. It provides for control of inshore and inland fisheries, fishing harbors, and licensing of fishermen and allied workers. It also regulates fishing methods and gear, fish-processing industries, and provides for fish conservation and culture. The Act does not cover either coastal or deep-sea fishing.

Base for Foreign Fishing Vessels

Singapore's importance as a base for foreign fishing vessels has been growing steadily. Soviet fleets fishing in the Indian Ocean and whaling in Antarctic waters take on fuel, water, and other supplies at the port.

Building New Fishing Harbor

Construction of the large fishery complex at Jurong is lagging, but work is continuing and plans for the new fishing harbor should be made public soon. Singapore also plans to establish an FAO southeast Asia fisheries training center, and to reopen the former British fishery research station at Changi. (U.S. Embassy, Singapore, Jan. 10, 1969; Oct. 11, 1968.)

Taiwan

'KURUMA' SHRIMP IS CULTIVATED SUCCESSFULLY

The government's fisheries research station at Taiwan has succeeded in artificially breeding 'kuruma' shrimp. About 50,000 larvae were raised in the hatchery for about 20 days, then transferred to the nursery, and released in the ponds. This experiment was the first of its kind in Taiwan.

Because it was successful, the government intended to build a shrimp hatchery in Pingtung Province by the end of 1968, and planned to rear artificially about 50,000 larvae per female shrimp in 3 months. ('Shin Suisan Shimbun Sokuho,' Nov. 9, 1968.)

Malaysia

SABAH'S FISHING INDUSTRY IS GROWING

The Government of Sabah is transforming fisheries into a thriving and competitive industry. In 1968, M$2.9 million (US$960,000) were provided under a development plan for fisheries research and expansion. The government also allocated M$95,000 (US$31,000) for a pilot project for oyster and cockle culture to increase food production and improve the protein balance. If the project is successful, oyster and cockle culture will be introduced on a commercial scale and become an additional source of income for local fishermen.

Completed Projects

A Grant to Fish Cooperatives Scheme provides subsidies for local fishermen, including the outright grant of an outboard motor for every new fishing boat as well as modern fishing gear. During the first six months of 1968, Sabah fishermen received 72 outboard motors. The Fisheries Ministry has built 4 modern trawlers for gear experts to demonstrate modern trawling techniques to local fishermen.

Construction Underway

A training center for young fishermen, now being built on Labuan Island in eastern Sabah, should be completed by 1970 and a small fish waste factory for fish meal production is being built in Lahad Datu.

Future Plans

Plans have been made to improve fishing ports and to expand and modernize freezing and storage facilities. The Government also plans to build a fish cannery, and would welcome foreign participation in the project. The lack of canning facilities forced Sabah to import about M$4 million (US$1.3 million) worth of canned fish in 1967.

Freshwater Ponds

By the end of 1967, 1,135 freshwater ponds covering 143.5 acres had been built with government grants. During the first six months in 1968, another 60 ponds covering 22 acres were constructed.

Fishery Exports Rise

As a result of the Government's fisheries modernization and expansion, Sabah exported 2,300 metric tons of fishery products worth M$7.5 million (US$2.5 million) in 1967, including some to the U.S. In 1967, fishery products were Sabah's third largest export after rubber and timber. In 1968, fishery exports may have been overtaken by palm oil, which has an extremely fast export growth rate. However, 1968 fishery export data, not yet known, may exceed those of 1967.

Manpower Problems

One of the major problems facing Sabah's fast growing fishing industry is manpower. In the past few years the industry has had trouble in recruiting, because young Malaysians prefer the easier life in the cities to the hard and tedious life at sea. The number of Sabah's fishermen, estimated at 8,000, has not increased substantially in recent years. (U.S. Consulate, Kuching, Jan. 3, 1969; 'Sabah Times,' Dec. 28, 1968; 'Japan Times,' Dec. 9, 1968.)

India

TO DEVELOP SHRIMP RESOURCES

Surveys of the shrimp resources off the coasts of India are continuing because there is considerable interest in further development. India's shrimp catch in 1967 was 98,000 metric tons.

Present Fishing Area

The total sea area between the Indian coast and 100 fathoms is approximately 108,000 sq. mi.; only a small fraction is presently exploited. The Continental Shelf is from 25-62 miles wide, but Indian shrimp fishing is confined to a narrow belt of about 9 miles.

Survey Results

Current surveys indicate that the largest shrimp are available at depths of 25 to 45 fathoms. Although many surveys have been made in adjacent waters by Indo-Norwegian Project, survey findings are available to Indian collaborators or Indian companies only.

Government Assistance

To assist in developing the shrimp industry, the Government intends to import 30-40 trawlers; 40-60 small trawlers are being built locally. Several American companies have considered investing in this fisheries development but have withdrawn from active participation for several reasons; however, some

India (Contd.):

American companies are still interested in investing in Indian fisheries. (U.S. Embassy, New Delhi, Jan. 10, 1969.)

* * *

SPINY LOBSTER FOUND OFF KERALA COAST

India's spiny lobster fishery and exports are very small compared to other seafoods like shrimp. In 1967, India exported 128 metric tons of lobster, valued at US$310,000. In 1966, she exported 81 tons worth US$194,000. Six species of spiny lobster, Genus *Panulirus*, are found in India. The most important commercially is *Panulirus homarus* (Linn.) or *Panulirus dasypus* (Later.). Lobster occurs in almost all rocky coasts, but the Kanyakumari District of Madras State is the principal area. A few places north of Calicut also support the fishery to some extent. A larger lobster catch could form the basis of a valuable export trade. The fishery seems to be dwindling because of indiscriminate fishing. It may be necessary to impose size restrictions and prohibit catching of berried females.

The Indo-Norwegian Project (INP) has located a spiny lobster source in the deep-water regions off the Kerala coast. INP trawlers have caught mostly *Parapandalus* and other varieties of shrimp, but a fairly sizable quantity of the spiny lobster *Puerulus sewelli* has been found in the catches.

Puvar to Cochin Distribution

During 1958-63, the Kerala University Oceanographic Department, with R/V 'Conch,' surveyed the deeper waters beyond the 100 fathom line from Puvar (south of Trivandrum) to Calicut. Although the intensity and depths of the lobster population vary from place to place and year to year, the lobster bed is almost continuous at a depth beyond 100 fathoms, from Puvar in the south to Cochin in the north. The investigation was not carried out south of Puvar. Judging from the hydrographic conditions and nature of the substratum, it is likely that the species distribution also extends towards the south.

The length of the specimens collected by INP varied from 107 to 195 mm. (4.2-7.8 in.). Females were fewer in number, but most caught during January to April were berried. In live specimens the body was light orange with a slight reddish tint. Though other species of lobster, like *Palinustus mossambica*, *Thenus orientalis*, and *Scyllaras* sp. also were observed in the offshore regions in various types of substrata, they are not obtainable in sizable quantities and hence are not of economic importance.

INP success in obtaining good catches of both deep-water shrimp and lobster shows the urgent need for more detailed investigation of the new resources, and opens better scope for offshore fishing with large trawlers. ('Seafood Trade Journal.')

SOUTH PACIFIC

American Samoa

GOOD ALBACORE FISHING IN JANUARY

Albacore fishing was good off American Samoa in January 1969. Longliners were landing an average 1.2-1.3 tons and taking as much as 2 tons per set. The favorable fishing conditions and prices have raised fishermen's hopes. Frozen round albacore deliveries were bringing a new high of US$415 a short ton.

About 14 Japanese, 20 South Korean, and 40-50 Taiwanese vessels were operating out of American Samoa. The growth of the Taiwanese fleet was attributed to the fact that the tuna fishing industry in Taiwan is government-backed. ('Katsuomaguro Tsushin,' Jan. 10, 1969.)

AFRICA

South Africa

FISHING INDUSTRY EXHIBITION
SLATED FOR OCT. 1969

'South African Shipping News and Fishing Industry Review' is sponsoring a fishing industries exhibition to be held in Cape Town, South Africa, Oct. 20-25, 1969. The exhibition will focus on the display and testing of new fishing equipment, gear, and scientific aids. Space has been reserved for foreign governments desiring to mount a national display.

Export Possibilities

The exhibition should offer excellent export-promotion opportunities for U.S. commercial fishing equipment manufacturers interested in the South African market. The area of greatest interest will be electronic fish-finding gear. Other attractive export possibilities are processing-plant equipment and preserving machinery for pilchards to be canned on shore. Interested U.S. firms should write to: South Africa Exhibition Organizers (Pty.) Ltd., P. O. Box 2900, Johannesburg, South Africa. (U.S. Consul, Cape Town, Oct. 18, 1968.)

South & South-West Africa

SHOAL FISH CATCH, JAN.-SEPT. 1968

The 1968 fishing season ended on Sept. 15; in 1967, it ran until Sept. 30.

South Africa's Sept. 1968 catch yielded 5,715 tons of fish meal and 65,436 imperial gallons of fish body oil. In South-West Africa, September production was 21,399 tons of fish meal and 4,440 long tons of fish body oil.

Shoal Fish Catch, January-September 1968

Species	1968		1967	
	Jan. -Sept.	Sept.	Jan. -Sept.	Sept.
	(Short Tons)			
South Africa:				
Pilchards	103,728	1,572	80,963	1,049
Maasbanker	1,507	-	9,427	-
Mackerel	99,325	-	153,071	-
Anchovy	187,165	23,272	304,060	33,530
Red-eye herring	14,908	-	13,973	-
Total	406,633	24,844	561,494	34,579
South-West Africa:				
Pilchards	730,828	64,310	724,710	65,650
Maasbanker	54	-	100	-
Anchovy	124,761	20,202	7,503	741
Total	855,643	84,512	732,313	66,391

In addition, the 2 South African factoryships operating off South-West Africa took 614,634 tons of pilchards; 47,942 tons were taken in September. ('The South African Shipping News and Fishing Industry Review,' Nov. 1968.)

WHY DOES THE SEA FOAM?

Foam is made up of air bubbles separated from each other by a film of liquid. Bubbles coming together in fresh water coalesce, but bubbles coming together in salt water bounce off each other.

Most bubbles in the ocean are caused by wind waves, but they may also be produced by rain and even snow. The bubbles that form along the seashore are very small, mostly less than $\frac{1}{2}$ millimeter in diameter.

When bubbles rise to the surface, they burst and release salt spray into the air, a fact well known to any wearer of glasses who has been on shipboard or at the seashore. Each bursting bubble causes a jet of several drops to rise to heights up to 1,000 times the bubble diameter. It is believed that most of the airborne salt nuclei come from bursting bubbles. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

SALMON BLINTZES

Salmon Blintzes are just the thing to serve because they can be prepared ahead of time. An interesting combination of salmon and cottage cheese is blended with egg, spiced with cinnamon-sugar, then rolled in the blintzes and refrigerated until ready to use. Browned in butter just before serving and topped with sour cream and cherry or strawberry preserves for a sweet-sour taste, Salmon Blintzes will bring flavor perfection and the drama of the unusual to your entertaining. So get out the party hats and horns, the bells and candles--and have a party!

Salmon Blintzes

1 can ($7\frac{3}{4}$ ounces) salmon	$\frac{1}{4}$ teaspoon cinnamon
1 cup cottage cheese	12 Blintzes
1 egg	1 cup sour cream
$\frac{3}{4}$ teaspoon salt	$\frac{1}{2}$ cup cherry preserves
2 tablespoons sugar	(or strawberry preserves)

Drain and flake salmon. Add cottage cheese, egg, sugar, salt, and cinnamon. Mix thoroughly. Place about 2 tablespoonfuls of the salmon mixture on the browned side of each blintz. Spread the filling to within an inch of the edge. Fold the bottom edge of the blintz up about an inch over the filling. Fold the two sides of the blintz in about $\frac{3}{4}$ of an inch over the filling. Then finish rolling the blintz from the bottom. The blintzes may be made to this point and refrigerated until ready to use.

Place blintzes in a single layer in melted butter in a 10-inch fry pan. Fry at a moderate heat for 5 to 6 minutes or until brown. Turn carefully. Fry 5 to 6 minutes longer or until blintzes are brown. Drain on absorbent paper. Place 2 blintzes on a small plate. Top with sour cream and cherry preserves. Making 6 servings.

Blintzes

$\frac{3}{4}$ cup all-purpose flour	2 eggs, beaten
$\frac{1}{4}$ teaspoon salt	Oil
1 cup milk	

Combine flour and salt. Combine milk and eggs. Add gradually to flour mixture. Stir until smooth. Pour 2 tablespoons of batter into lightly oiled 6 inch fry pan. Tip the fry pan so that the batter completely covers the bottom. Fry at a moderate heat for 3 to 4 minutes or until blintz is brown on the bottom and set on top. Remove from pan. Makes 12 blintzes. (Source: Interior Department's BCF.)

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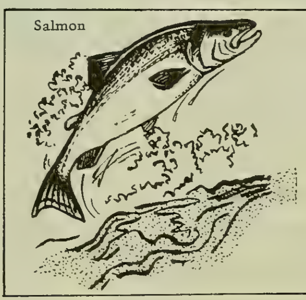
SALMON

The anadromous Pacific salmon fisheries of the United States are of great importance from Bristol Bay, Alaska, to the Sacramento River, California. As early as 1829, settlers in the Northwest were salting and exporting salmon from the great runs up the Columbia River. By 1840 a few salting stations had been set up on Alaska shores, but salmon were first canned along the Sacramento River. By 1936, the peak year for the Pacific salmon fisheries, more than 100 canneries engaged in canning most of the 791-million-pound catch of U.S. fishermen.



In the years since, the Pacific salmon have been sharply reduced in number because of pollution, diversion and power dams, overfishing, and reduction of spawning grounds. Despite all this, salmon is still one of the most valuable fishery resources of the United States. The 310 million pounds caught in 1961 brought $52 million to the fishermen, while the fishery products prepared by the processors were valued at over $124 million. The commercial fishery for salmon is principally by purse seines, gill nets, beach seines, and by trolling.

Five kinds of salmon (known by a variety of names) come from Pacific waters: sockeye, chinook, coho, pink, and chum. Pacific salmon spend most of their lives in the ocean; when mature, they return to spawn in their home streams. Some go a short distance upstream, others go as much as 2,000 miles upstream to spawn; all die after they spawn. Months later the new generation emerges from the gravel. Some young make their way downstream to the sea immediately; others remain in fresh water for a year or two.

--Conservation Note 15, "Commercial Fisheries of the Pacific Coast," Fish and Wildlife Service, U.S. Department of the Interior. (Available free from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209.)

Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

Home Economics Research

The Bureau of Commercial Fisheries maintains a National Home Economics Research Center (NHERC) at College Park, Maryland, to advise the fishing industry of current trends in the food field that may help to expand the use of fishery products. NHERC also advises the food trade on the availability, selection, and serving of fishery products. Research includes development of recipes for users such as schools, military establishments, other institutional operators, and individual consumers. Work is conducted to determine the nutritive value of prepared fishery products. The findings are distributed to industry, food trade associations, the public, State and Federal agencies--Departments of Agriculture, Defense, and Health, Education and Welfare--and national organizations, such as the American Home Economics Association, American Dietetic Association, and the American School Food Service Association.

The College Park facility and personnel are also used to train Bureau and State fishery home economists. For further information, contact the Bureau's National Home Economics Research Center, P.O. Box 128, College Park, Maryland 20740.

COMMERCIAL FISHERIES Review

VOL. 31, NO. 4

APRIL 1969

COVER: Priest of small village in Ecuador and fishermen examine catch--mostly small herringlike fish--made with beach seine. (FAO Photo: S. Larrain)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

Fishermen's Memorial
Gloucester, Mass.

The Bureau of Commercial Fisheries and The Bureau of Sport Fisheries and Wildlife make up The Fish and Wildlife Service of The United States Department of the Interior.

Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

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CONTENTS


WORLD CATCH, BY LEADING COUNTRIES, 1958-68
Billion pounds
24.5
21.0
17.5
14.0
10.5
7.0
3.5
Peru
Japan
U.S.S.R.
China
(Mainland)
Norway
United States
1958
1963
1968
Note:--Live weight basis.

U.S. FISHERMEN CAUGHT 4.1 BILLION POUNDS IN 1968 WORTH $471.5 MILLION

In 1968, U.S. fishermen caught 4.1 billion pounds of fishery products, which they sold for $471.5 million. This was almost $32 million more than their 1967 sales--and nearly equal to the record $472.4 million they received for their larger 1966 catch of 4.4 billion pounds. These data are contained in BCF's "Fisheries of The United States. . . 1968."

Declining sharply were landings of anchovies, haddock, Pacific hake, tuna, blue crabs, and king crabs.

Also lower were catches of alewives, Pacific halibut, and shrimp.

The total catch would have dropped below 1967's except for greater landings of menhaden, Pacific salmon, sea herring, jack mackerel, and yellowtail flounders. And there were record catches of shrimp in Maine and Oregon waters, albacore tuna off Oregon, and northern and spiny lobsters.

How Catch Was Used

In 1968, about 2.3 billion pounds of the domestic catch were used as food for people.

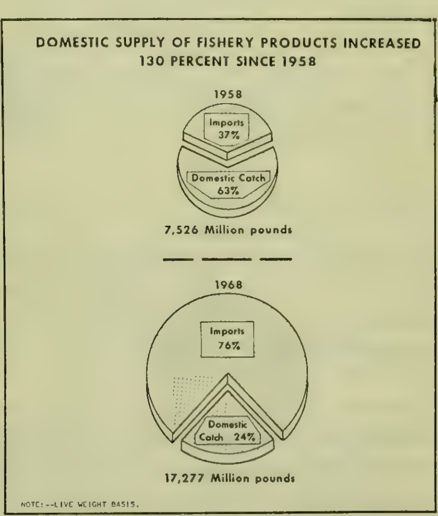
The total 1968 catch for food was marketed as follows: 1,503 million pounds (round weight) fresh and frozen; 970 million for canning (includes animal food); 76 million for cured products; and 1,567 million for reduction to meal, oil, etc.

Record 11.46¢ A Pound

In 1968, the average price-per-pound paid to fishermen hit a record 11.46 cents. In 1967, it had been 10.84; in 1966, 10.81 cents.

PROCESSED FISHERY PRODUCTS

The value of U.S.-processed fishery products from domestic and imported raw material was $1.3 billion--about 7% above 1967.



The canned pack of 43.4 million standard cases was worth a record $580.6 million.

Record packs of tuna and pet food were achieved. There were large increases in canned production of Pacific salmon, Maine sardines, mackerel, and shrimp.

The fish stick and portion industry set records: 270.7 million pounds worth $108.8 million.

Processors of breaded shrimp produced 103.7 million pounds worth a record $98.5 million.

Groundfish-fillet production was less than in 1967, "but producers of other type fillets had a relatively good year."

Processors of fish and shellfish specialty dinners--and other packaged products--produced more. Continued industry growth was indicated.

On Oct. 31, 1968, cold-storage holdings of frozen fishery products climbed to a record 288 million pounds.

As 1969 Began

The fishing industry presented a mixed picture as 1969 began: some parts were mired in economic and other problems; many parts were in excellent shape.

Fishermen were receiving a high dollar value for their catch. The processing industry was making "excellent gains." Americans were eating more seafood. There was strong demand throughout 1968 for "some canned products, fish sticks and portions, fillets and steaks, lobster products, shrimp items, and fish and shellfish specialty dinners, etc."

Per-capita consumption reached 11 pounds in 1968, the highest since 1954.

IMPORTS

In 1968, the U.S. imported 13.2 billion pounds (live weight) of all fishery products, far exceeding 1967's high of 9.9 billion pounds.

The value of imports was $798 million, $90 million higher than the 1966 record of $708 million.

Of the 13.2 billion pounds, 3.2 billion were edible fishery products; 10 billion were industrial fishery products (33% above 1967's record 7.5 billion).

SOME HIGHLIGHTS

- Domestic shrimp fishermen were paid a record $113.3 million for their catch. For the second consecutive year, this fishery exceeded $100 million.

- Shrimp accounted for 24% of the total U.S. value paid for all species.

- The menhaden catch of 1.4 billion pounds was 34% of total catch.

- Louisiana led all States in volume of catch--747.5 million pounds. It was followed by California, 446.1 million pounds; Alaska, 433.7 million pounds; Virginia, 388.5 million pounds; and Massachusetts, 337.4 million pounds.

- Alaska was No. 1 in value of catch: $71.6 million. Then came California, $53.3 million; Texas, $44.2 million; Massachusetts, $41.6 million; and Louisiana, $40.6 million.

• For the 20th consecutive year, San Pedro, California, led all domestic fishing ports in value of catch: $29.1 million.

• U.S. foreign trade in fishery products was a record $865.8 million in 1968--up $75.7 million.

• A new and potentially important Alaska sea-scallop fishery began in 1968. Nearly 2 million pounds of sea scallop meats were landed.

• In 1968, construction of shrimp trawlers continued at a record pace. At least 350 new vessels joined the Gulf shrimp fleet.

WORLD FISHING

Peru led the world in fishery landings--followed by Japan, China (Mainland), USSR, Norway, and U.S. But world ranking by value is considerably different. Here, Japan leads, followed by the U.S. Peru ranks about 15th, and the USSR might be lower.

Japan led the world in per-capita consumption of fishery products with 61.2 pounds of edible meat. Then came Denmark, 47.5; Sweden, 45.1; Norway and Portugal, 43.4 each; the Philippines, 33.8.

WHAT IS THE DIFFERENCE BETWEEN A SEA AND AN OCEAN?

The terms "sea" and "ocean" are often used interchangeably in referring to salt water. However, from a geographic point of view, a sea is a body of water that is substantially smaller than an ocean or is part of an ocean.

The term "seven seas" dates back to ancient times, referring to the seas known to the Mohammedans before the 15th century. These were the Mediterranean Sea, the Red Sea, the East African Sea, the West African Sea, the China Sea, the Persian Gulf, and the Indian Ocean.

In more recent times, Rudyard Kipling popularized the expression "seven seas" by using it as the title of a volume of poems. There has been a tendency to divide the world's ocean into seven oceans to retain this legendary number. The popular division is Arctic, North Atlantic, South Atlantic, North Pacific, South Pacific, Indian, and Antarctic. However, International Hydrographic Bureau at Monaco does not accept the existence of an Antarctic Ocean. Actually, of course, all limits of oceans are arbitrary, as there is only one global sea. The International Hydrographic Bureau subdivisions are primarily for the purpose of filing Notices to Mariners and have little to do with natural boundaries.

The International Hydrographic Bureau lists 54 seas; some are seas within seas. The Mediterranean Sea contains seven seas so one could sail the seven seas (of the Mediterranean) without ever venturing into an ocean. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

UNITED STATES

Gloucester Herring-Alewife Fishery Rises Sharply

Prior to 1967, the herring-alewife catch landed at Gloucester, Mass., was relatively small. During 1967 and 1968, however, one firm operated a reduction plant at Gloucester using these species caught by U.S. and foreign vessels. As a result, the annual catch has risen sharply:

	Catch		
	Alewife	Herring	Total
	..... (Million Pounds)		
1965	0.006	-	0.006
1966	0.006	0.001	0.007
1967	4.246	11.741	15,987
1968	-	53.727	53.727

1968 Herring Catches

In 1968, 21,037,000 pounds of herring were taken by U.S. vessels, 32,320,000 pounds by Canadian vessels, and 370,000 pounds by an Icelandic seiner. The Canadian and Icelandic catches were transferred at sea for delivery to the Gloucester firm.

The Canadian vessels are 100-foot-class combination purse seiners-otter trawlers, equipped with power blocks and sonar. These vessels fish with a seine skiff and fish seines 40 to 50 fathoms deep, and 250 to 350 fathoms long. The Icelandic vessel used a 120-fathom-deep purse seine.

BCF Explorations

In April, BCF's exploratory fishing research vessel 'Delaware II' conducted surveys to locate and sample commercial abundance of herring and red hake concentrations. Surveys and experimental fishing were carried out with a midwater trawl and a high-opening bottom trawl.

Study Spring Spawning of Georges Bank Haddock

The 1969 spring spawning of Georges Bank haddock was followed carefully by BCF's Woods Hole (Mass.) Laboratory. A sampling schedule was set for January-July with weekly samples from the commercial fleet and from BCF's 'Albatross IV'. Arrangements were made with Boston trawler skippers to supply fish landed in the round to provide gonads for examination.

Observations Began in 1968

The study continues observations begun in 1968. It was noted then that peak spawning did not occur until late April. This was considerably later than indicated by plankton surveys in previous years.

The Georges Bank haddock stock is in serious condition because of low survival of year-classes for the past 5 years. The cause is unknown. An intensive study of spawning process and fate of the spawn is essential to understand recruitment of fish to the fishery. The examination of gonads during spawning season is an important part of study.

Demand for Ocean Quahogs Grows

There is growing interest in the supply and use of ocean quahogs, Artica islandica. This is due to the success of a Rhode Island firm in using the ocean quahogs in its products--and to experiments at BCF's Gloucester (Mass.) Technological Laboratory. The experiments showed these clams to have potential food uses. The lab has received inquiries from several firms.

State Interested

Massachusetts is interested in the potential and promotion of ocean quahogs. The State had learned of the work by BCF's Exploratory Fishing and Gear Research Base and the lab

to find the resource, prepare acceptable products, and to promote the species. State officials agreed to work with the lab to acquaint coastal towns of the ocean quahog fishery potential.

The 'Clambo'

BCF staff participated in the first public showing of a product made from minced ocean quahog held together as a pattie. The binder was produced from pulverized fish flesh, the 'clambo'. The clambo's flavor can be controlled by varying the amount of quahog, starch, and spices--and by varying particle size of components.

BCF's 'Oregon II' Finds Heavy Fish Concentrations Off Louisiana

During 4 weeks of exploration off Louisiana, BCF's Oregon II recorded heavy echo-sounder indications of schools of rough scad and round herring. The schools were located just off the bottom in 110 fathoms depth south of Cameron and extended for 35 miles.

Salmon & Steelhead Trout Culture Practiced

Aquatic husbandry is practiced in many ways with varying success. Among the most successful is the Federally supported hatchery system on the lower Columbia River. This releases young salmon and steelhead to be caught later by commercial and sport fishermen.

In 1967 alone, BCF estimates, the hatchery program contributed well over 15 million pounds to catches in the Columbia and off the west coast. The cost of producing the fish was less than half their value when caught.

Program Improvement Possible

A BCF study indicates that catches could be increased by 10.5 million pounds a year if existing hatchery stations and techniques were used to full capacity. The cost would be about one-sixth the resulting annual value; it would be lowered further as research findings and new techniques were applied.

BCF provides funds and administers the program, which is conducted cooperatively with Oregon, Washington, and Interior's Bureau of Sport Fisheries and Wildlife.

Record Stocking of Fish in Great Lakes Scheduled

About 11.7 million hatchery-reared fish, principally salmon and lake trout, were scheduled to be planted in the Great Lakes in spring 1969. This will be more than 3 million above the 1968 high, according to the Great Lakes Commission.

Two major agencies are trying to rebuild the sport and commercial fish stocks: Michigan's Department of Natural Resources, which will release about 5.2 million salmon and steelhead (rainbow) trout, and the Great Lakes Fishery Commission, which will direct planting of 5.1 million lake trout. Also, the spring stocking programs of conservation agencies in New York, Ohio, Pennsylvania, and Wisconsin will include larger salmon plantings than their 1968 introductory releases, and the stocking of other game fish. Minnesota and Ontario will make their first coho plantings.

Where Released

Michigan's record-level fish-planting program will involve 41 streams tributary to lakes Michigan, Superior, and Huron. The coho salmon release of 3,950,000 smolt (yearlings) will go into 26 streams: Lake Michigan 2.9 million; Lake Superior 500,000; Lake Huron 550,000.

For the 900,000 young chinook salmon, the plantings by lake basin will be: Michigan 650,000; Huron 200,000; Superior 50,000.

The schedule for 320,000 steelheads or lake-run rainbow trout calls for releases in 22 streams: Michigan 205,000; Superior 55,000; Huron 60,000.

Lake Trout

The lake trout yearlings will be planted in lakes Superior and Michigan by the U.S.

Bureau of Sport Fisheries and Wildlife, and Minnesota, Wisconsin, and Ontario fishery agencies. The release of 3,097,000 trout in Superior will mark the fourth consecutive year over the 3-million mark. For Lake Michigan, 1969 is the first since the planting program began in 1965 that the number of trout released will be over 2 million (2,040,000). The waters of all four states bordering the lake will share this year's plantings.

Erie & Ontario

In the eastern Great Lakes--Erie and Ontario--last year's successful introduction of 143,000 cohos by Ohio, Pennsylvania, and New York has led these states to increase plantings to about 365,000 this spring. Ohio plantings in 4 locations will total about 95,000; in addition, 25,000 young rainbows will go into Lake Erie tributaries in the eastern section of the state. For Pennsylvania's Lake Erie streams, the release of coho smolt is expected to be about 125,000. New York coho plantings will total 145,000 fish: about 10,000 in a Lake Erie tributary. the remainder into impoundments on 3 Lake Ontario streams. The state also plans to release about 60,000 chinook salmon fingerlings in the Little Salmon River at the east end of Lake Ontario.

Ontario Province

The Province of Ontario will undertake its first coho plantings in the Great Lakes: 130,000 are scheduled for 3 streams at the west end of Lake Ontario; 20,000 will be placed in the Nipigon Bay area of Lake Superior. In addition to coho, the province will plant 35,000 splake (a lake trout-brook trout hybrid) in Georgian Bay, and rainbow trout in several Great Lakes areas.

Minnesota & Wisconsin

Minnesota's first coho release, about 100,000 yearlings, will be made in the French River, a Lake Superior tributary near Duluth. Wisconsin's initial planting of 25,000 coho in one Lake Michigan stream in 1968 will be expanded this spring to 5 streams; each will receive about 40,000 yearlings. Also, the state plans to place a total of 200,000 rainbow, brown and brook trout in Lake Michigan tributaries, and about the same number in Lake Superior streams.

East Coast Aquatic Plant Harms Clams and Oysters

A dark-green, cylindrical algae resembling forked macaroni appeared in 1957 at the eastern end of Long Island. Some fishermen call it 'spagetti weed.' Because it is a cold-water plant, it differs from the Codium (C. decorticatum) of the temperate and tropical waters of the east coasts of North and South America.

This plant grows so luxuriously it blankets the bottom and interferes with and destroys clams and oysters. It crowds out all other species. By 1962, it was observed near the mouth of Narragansett Bay and, later, in the Chatham and Cotuit areas of Cape Cod. The rizoids ('rootlets') or 'hold fasts' attach to hard objects on the bottom, including shellfish.

'Green Bumps' on Oysters

The 'green bumps' on oysters brought from Long Island and planted in Oyster River, Chatham, were the source of the Massachusetts invasion. The most recent reported infestation is Barnagat Bay, N.J. The State Conservation Department is trying to help shellfishermen salvage clams overgrown by Codium.

This subspecies of 'Codium frogile,' presumed native to Japan, spread throughout the Pacific and into the Atlantic. It was reported first in Europe around 1900. It thrives best in cold deep water and reproduces by fragmentation and zoospores (millions are released in February). ('Shellfish Soundings,' Feb. 26, 1969.)

Wisconsin U. Opens Eutrophication Center

An information center at the University of Wisconsin will provide researchers with many reference materials on eutrophication--"the aging process of surface waters enriched or fertilized by natural and waste-borne nutrients." This is reported by the Great Lakes Commission.

The Commission says the process is common to all water bodies. But man's activity has accelerated rates of aging--and upset

dramatically the balance of nature in more and more areas.

The eutrophication center will be associated closely with the research work of the University's Water Resources Center at Madison.

Demand for Fresh Fish Increases in Midwest

There is increasing demand for fresh fish in the midwest, report BCF personnel after interviewing distributors and retail buyers in several cities.

Several airlines, recognizing this demand, have maintained commodity rates for fishery products shipped to several points in the U.S. The airlines are looking into distribution problems faced by the fishing industry.

The Major Problem

The major need of distributors, retailers, and airlines is to locate a continuous supply of fresh products which would be shipped in suitable condition.

BCF sees a need for a uniform method of educating fresh-fish producers on the nature and potential of inter-regional markets.

Food Buyers from Abroad to Attend U.S. Conference

The U.S. Department of Agriculture and the Super Market Institute are sponsoring a conference for food buyers from abroad. It will be held in Atlantic City, N.J., May 11-14, 1969. By encouraging the world's top wholesale and retail food buyers to meet with their U.S. counterparts, the sponsors hope to build export markets for U.S. processed foods. U.S. Agricultural Attachés in leading dollar markets around the world have been promoting the conference. Many foreign importers have said they would attend.

A Switch for BCF

For BCF, which will participate, the conference turns around one of its important activities. For several years, BCF has been promoting exports of U.S. fishery products by taking part in foreign trade fair exhibits.

1969 'International Code of Signals' Is Available

The 1969 'International Code of Signals' is useful to all boat owners--of small craft using coastal waterways and of large offshore vessels. It answers questions about the meaning of flag hoists, how to signal for assistance, radio/telephone procedure, and ways to facilitate all types of necessary communication equipment of all seagoing vessels.

The book is available from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402. Price: $4 a clothbound copy.

The Code of Signals was adopted in 1965 by the UN's Inter-Government Maritime Consultative Organization. It is also published by France, Italy, Germany, Japan, Spain, Norway, Soviet Union, and Greece. The Code is understood by all nations.

Revised Code Effective

The revised Code became effective April 1, 1969. It will be used by all ships of the U.S. Navy, Coast Guard, and Merchant Marine; Naval and Coast Guard radio and shore stations, private marine radio stations, and marine departments of steamship companies.

There are 446 signals for distress and emergency, 327 for casualties and damages; 328 for navigation and hydrography; 177 for maneuvers; 137 pertaining to cargo, crew, fishing, pilot, port and harbor; 169 for meteorology and weather; 13 for international sanitary regulations; and 503 for medical assistance and weather.

A Correction

The picture story on Menhaden, CFR Jan. 1969, p. 16, should have said that today nearly all menhaden are used to make high protein fish meal.

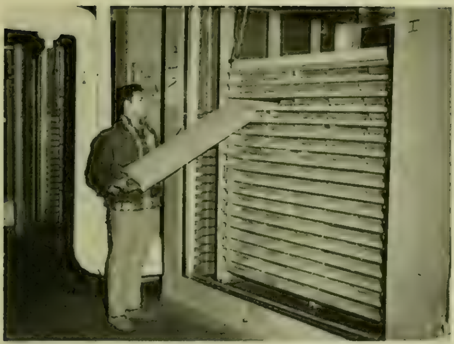
'SEAFREEZE ATLANTIC' Sails on First Fishing Trip

The largest fishing vessel to fly the U.S. flag--the 'SEAFREEZE ATLANTIC'--left its home port of New Bedford, Mass., March 28, 1969, on its first fishing trip. The $5 million, 297-foot, 3,120-ton freezer stern trawler will fish off Labrador "for anything that can be found in the water," a company spokesman said. He presumed the fish would be groundfish, codfish, and pollock.

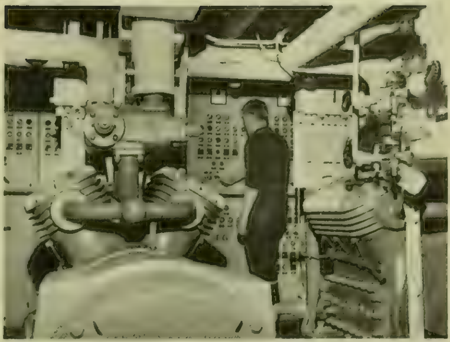
The vessel cruises at 14.4 knots and can cover 26,000 miles. She is carrying a crew of 54 in air-conditioned cabins: 10 fishermen, 28 processing personnel, 7 in engineroom, and 9 officers.

A sistership, the 'SEAFREEZE PACIFIC,' will fish off the Pacific Northwest from a West Coast port.

The trawlers can stay at sea 2 months and process their catch. They are equipped to use nearly everything they catch. Inedible or trash fish, and waste from the cleaning process, will be converted to fish meal and fish oils.

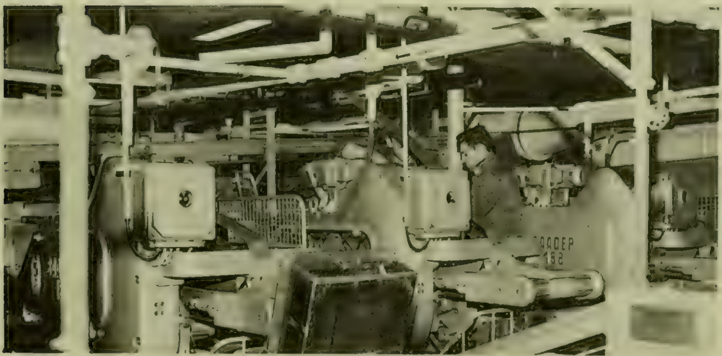


One of three tray freezing units.



Refrigeration plant.

Fish meal plant.



Filleting machines--fish processing factory.

(Photos: Robert K. Brigham)

Fishery Legislation Proposed in Congress

More members of Congress are showing their interest in greater utilization and conservation of ocean resources.

On Mar. 20, Sen. Magnuson introduced S. 1588, a bill to establish a National Institute of Marine Medicine and Pharmacology. Senators Fong and Pelly were cosponsors.

Speaking in support of the bill, Sen. Magnuson quoted a letter from a member of the Commission on Marine Sciences, Engineering, and Resources stating that "Marine bioactive substances as a source of new commercial pharmaceutical products constitute an almost completely unexplored area of research. At the present time there is not a single industrial organization or governmental agency that is making a continuous systematic exploration of new bioactive substances from marine creatures."

Quoting from a report of the National Conference on Drugs from the Sea, Aug. 1967, Sen. Magnuson added: "The Institute should be established for the purpose of conducting and supporting marine research. . .advancing scientific knowledge in marine biochemistry, pharmacology, toxicology, nutrition, microbiology. . .bionics and technology, as it may relate to the causes, diagnosis, prevention, treatment and control of physical and mental diseases, and other impairments of man."

Sen. Magnuson added that he is "convinced that a U.S. Institute of Marine Medicine and Pharmacology could make a contribution to world health unexcelled by that of any other nation."

Marine Sanctuaries

On Mar. 20, Sen. Brooke introduced for himself and Sen. Kennedy S. 1592, the Marine Sanctuaries Study Act of 1969. This would authorize the Secretary of the Interior to study the most feasible and desirable means of establishing certain portions of the tidelands, Outer Continental Shelf, seaward areas, and Great Lakes of the U.S. as marine sanctuaries.

Sen. Brooke cited the dangers of uncontrolled exploitation of these areas. He noted that "oil drilling operations which once destroyed fish with their seismic explosions have now been brought under control, but underwater gear and drilling equipment still remain to plague the fishermen with his lines and nets." He also deplored the fact that "landings of fish by U.S. fishermen have remained constant for 30 years, and that this Nation, with one of the most extended coastlines and richest marine resources in the world, accounts for only 4% of the world's fish catch."

New Department of Oceanographic Services

On Mar. 25, Rep. Pepper introduced H.R. 9482, to establish a Department of Oceanographic Services within the cabinet of the President. He said: "To those who might question the advisability of yet another 'bureaucratic department'. . . . Under the present Federal setup relating to maritime and marine interests, there is a total of 11 separate agencies engaged in the marine sciences. This legislation envisions the coordination and consolidation of the major civilian marine functions of the Federal government to accomplish. . .the expansion of exploration of marine environs and the use of marine resources, and development of port and harbor and estuarine areas. . . ."

The new department would have four Assistant Secretaries, one for Marine Fisheries.

Territorial Seas

On Mar. 26, Reps. King, Whalley, and Riegle introduced H.J. Res. Nos. 602, 604, and 606, respectively. These were joint resolutions to declare U.S. policy with respect to its territorial sea.

Rep. Edwards, Ala., introduced H.J. Res. 605 on reciprocity in U.S. territorial waters. Addressing the House, Mr. Edwards said this resolution was designed to stiffen U.S. policy in establishing and enforcing our territorial waters claims and ocean fishing limits.

He proposed that "we should adopt a policy of reciprocity in our territorial waters and fishing limits. . .we would impose on any ship the same territorial and fishing limits which that ship's national government imposes in its own coastal waters."

The resolution also calls for a new international conference to reach agreement by all coastal nations on territorial limits.

--Barbara Lundy

OCEANOGRAPHY

Vast Study of Atlantic East of Barbados Starts in May

The U.S. is cooperating with Barbados in setting up an extensive study of the links between sea and air. The planners say "the mechanism of sea-air interaction is almost unknown, yet it is the primary process which drives the atmosphere's circulation and its weather systems. Unless this process is explored and understood it will be impossible to extend weather prediction to more than a few days."

The project is called BOMEX--Barbados Oceanographic and Meteorological Experiment. It is "the most intensive scientific investigation ever made over a large ocean area."

Area Involved

In May, June, and July 1969, 24 planes, 10 ships, several satellites, 12 buoys--and a vessel that "flips" from horizontal to vertical position--will gather data from the atmosphere and ocean covering 90,000 square miles of the Atlantic east of Barbados; the area stretches vertically from an altitude of 100,000 feet to the sea floor at 18,000 feet. About 1,500 people will take part in data gathering.

BOMEX is the first in a series of large-scale research projects planned by many nations under the Global Atmospheric Research Program (GARP) and directed toward development of a World Weather Watch.

Combined Operation

BOMEX combines the efforts of oceanographic and meteorological communities with 7 Federal departments and independent agencies, 19 universities, and 7 industrial laboratories in the U.S., Canada, and Barbados. For the U.S. Government: Department of Commerce (ESSA); Department of Defense; Interior Department's BCF; Department of Transportation (U.S. Coast Guard); Atomic Energy Commission; NASA; and the National Science Foundation.

BOMEX Objectives

Dr. Joachim P. Kuettner, BOMEX Director, explained the objectives of the BOMEX experiment. He described the air-sea interface as "the scene of a complex and continuous exchange of energy, water, gases, and particulates."

Dr. Kuettner said: "Most of the heat received from the sun is stored in the tropical oceans between the latitudes of 30 degrees North and 30 degrees South, a region representing half the earth's surface.

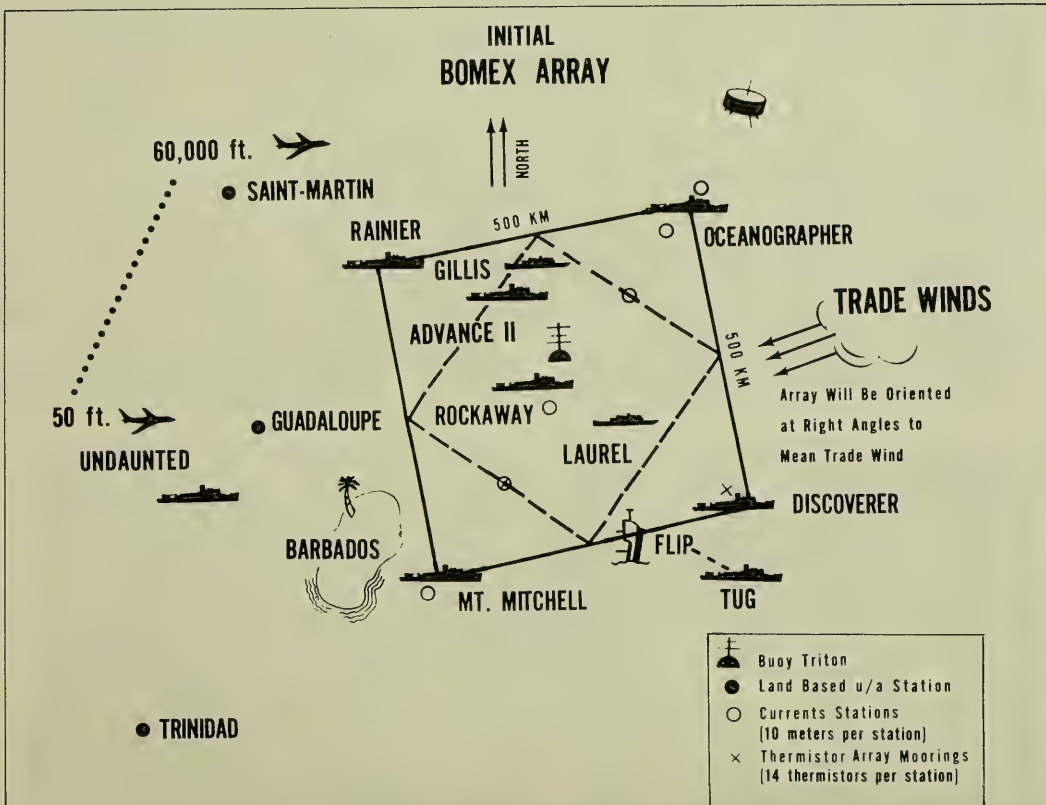
"In contrast, the earth loses heat by radiation almost uniformly at all latitudes, so heat has to be transported from equatorial regions to higher latitudes. Strangely enough, this transport is not done by the ocean, but primarily by the atmosphere. This process, of which relatively little is known, seems to occur in three stages. First, the energy in the ocean transfers to the atmosphere in a turbulent boundary layer about 6,000 feet thick. Most of this energy moves from ocean to air as latent heat in the form of water vapor. Next, the energy finds its way from the boundary layer to the upper layers of the troposphere. Finally, it is transported to higher latitudes by fast-moving air currents, sometimes in the nature of jet streams."

BOMEX will explore the first 2 steps in this process. It will examine in detail "the exchange of energy between ocean and atmosphere, and the vertical and horizontal spreading of these energies within each fluid."

An attempt will be made to predict the area-wide sea-air interactions in a mathematical model based on conventional and satellite observations.

Air Armada in Action

During July, a major study will be conducted by many aircraft to explore tropical weather disturbances. The objective will be to gain information needed to improve mathematical models of the global atmosphere. These flights will be based on continuous photos received at Barbados from NASA's ATS-III (Applications Technology Satellite). The satellite will be moved to a stationary position above Barbados.


INITIAL
BOMEX ARRAY
60,000 ft.
NORTH
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Mean Trade Wind
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GUADALOUPE
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UNDAUNTED
LAUREL
DISCOVERER
BARBADOS
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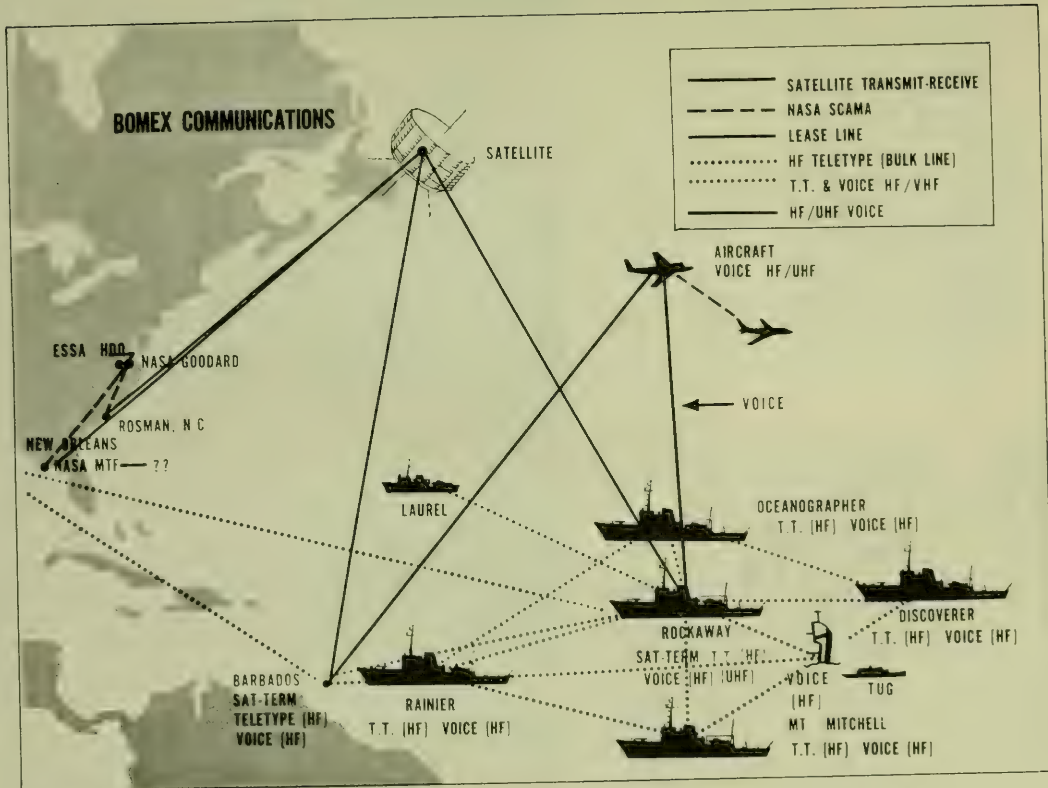
BOMEX COMMUNICATIONS
SATELLITE TRANSMIT-RECEIVE
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LEASE LINE
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T.T. & VOICE HF/VHF
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AIRCRAFT
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NASA GOODARD
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T.T. (HF) VOICE (HF)
BARBADOS
SAT-TERM
TELETYPE (HF)
VOICE (HF)
RAINIER
T.T. (HF) VOICE (HF)

Data from 5 ESSA satellites and 2 Nimbus satellites will be used to provide photos of the cloud cover. Several aircraft will obtain detailed observations of clouds, sea-surface temperature, sea state, and other observations to provide "ground truth" for interpreting the space observations.

Armada of Research Vessels

Many platforms and observing systems are required to support BOMEX. The vessels are: the U.S. Coast and Geodetic Survey (CGS) ships 'Oceanographer,' 'Discoverer,' 'Rainier,' and 'Mt. Mitchell'; the U.S. Coast Guard (USCG) cutters 'Rockaway,' 'Laurel,' and 'Courageous'; the U.S. Navy Ship 'Gilliss'; BCF's 'Undaunted'; and The Cape Fear Technical Institute's SS 'AdvanceII'.

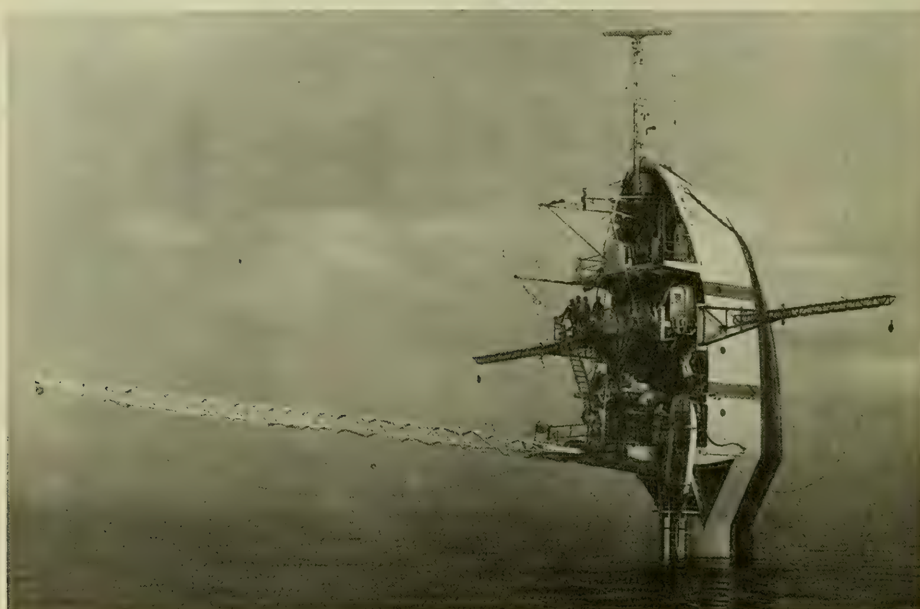
CGS ships will be stationed at the 4 corners of the 5-degree-square experimental area; the Rockaway will be in center. Special mooring systems will be installed on these 5 vessels to anchor them at their stations. It will be the first time ships of this size will be anchored in 18,000 feet for such long periods.

The 'FLIP'

A unique stable platform, the FLIP (Floating Laboratory Instrument Platform), is being made available by the U.S. Navy and Scripps Institution of Oceanography between May 2 and 29. It will be towed in its horizontal position to the southern edge of the array. There, its ballast tanks will be flooded to "flip" it to the vertical position. When the platform is fully vertical, 55 of the entire 355-foot length are above water; the other 300 feet extend well down into the "silent, motionless part of the ocean."

A large variety of aircraft will provide frequent measurements close to the ocean surface and at very high altitudes.

Communications and Search and Rescue will be handled by the Coast Guard. It will conduct communications experiments using satellites to test feasibility of using satellite



'FLIP' in flipped position. (Official U.S. Navy Photo)

communications for future activities similar to BOMEX.

The Aerospace Rescue and Recovery Service (ARRS) of the Military Airlift Command, USAF, will pick up data from the 5 moored ships to ensure very rapid feedback of samples to the scientists at Barbados. ARRS will also provide emergency resupply and recovery support for all BOMEX vessels.

Sophisticated Equipment

Between March 3 and April 23, special equipment was installed at Gulfport, Miss., aboard the 5 fixed vessels: Signal conditioning and recording devices, sensors, meteorological booms, boundary layer instrument packages, and the free-fall mooring systems.

NASA is "designing, installing, maintaining, and operating a computerized data-management system for the project." Five Signal Conditioning and Recording Device (SCARD) units are being installed on the 5 fixed vessels to record data from atmosphere and ocean. The tapes will be flown to NASA's Mississippi Test Facility to be processed and reduced. This will provide a "quick look" to the BOMEX Director to establish data validity and enable him to modify the observation program if necessary. The data will become part of BOMEX's master data file.

ESSA is the lead U.S. agency for the experiment. It is the U.S. Cooperating Agency with Barbados. The Barbados Cooperating Agency is the Ministry of Home Affairs.

Bathymetric Charts Guide Mariners

Bathymetric charts showing the sea floor's diversified topography are among the most valuable navigational guides available to Navy and civilian mariners, believes the U.S. Naval Oceanographic Office (NOO). The charts also may lead toward more effective use of the sea. The NOO-produced charts result from scientific interpretation of sounding data collected by military and merchant ships.

After evaluating these data for accuracy, the charting specialists plot the 'best' information. From it, they draw depth contours to show submarine mountains, ridges, canyons, valleys, and trenches. (See charts and sketch.) Then, navigators using advanced echo-sounding equipment can use the charts to guide their ships "from seamount to escarpment to ridge in the open ocean."

Chart's Uses

Also, the navigators can determine positions and obtain running fixes by locating their ships in relation to the underwater topographical features shown on bathymetric charts. The charts also aid geophysicists, geologists, and oceanographers studying the oceans. Charts can assist military and civilian planners to prepare for routing submarine cables and selecting sites to install equipment and facilities.

NOO states that each bathymetric chart comprises an area "equal to Utah and Nevada combined, with a topography that may be equally as diversified."

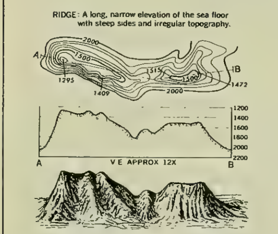
Water conceals the ocean floor, so contours developed from soundings of submarine geographical features for such a large area "represent a most difficult and exacting task." The operation is like charting the mountains and valleys of Utah and Nevada from contours based on elevation readings taken 5 to 10 miles apart with a spacing of 2 to 50 miles.

Charting Ocean Topography

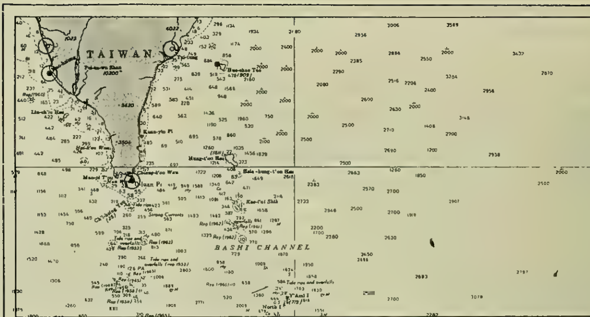
Soundings--measurements of water depth beneath the ship--are taken at intervals by depth recorders. The soundings give an idea of deep and shallow points. Specialists review these points carefully to determine submarine mountain ranges, ridges, valleys, etc.

However, even the slightest difference in positions of 2 independent observers working from unstable platforms at different times could result in error. "One (observer) could actually be looking at the elevation of a peak, while the other was inspecting the elevation in a valley or basin."

NOO points out that although absolute accuracy "can never be achieved by this means, the trained geologist or bathymetrist can interpret the combined observed data, including that collected on planned hydrographic surveys and that obtained along 'random tracks'--the courses taken by civilian and military ships on merchant routes or on operations--and come up with a reasonable portrayal of the true land forms."



Example of Submarine Topography as Portrayed by Bottom Contours, Profile, and Plan



Section of Small-Scale Sailing Chart, Taiwan Area, H.O. Chart 14,200, 1961 Edition.

Section of BC Chart 2404, Taiwan Area (Reduced), 1962 Edition.

BATHYMETRIC CHART SHOWS OCEAN FLOOR--Bathymetric charts, such as one just above, are contoured to show ocean floor's topography. The contours result from interpretation of countless soundings and can produce drawing of a submarine mountain (upper left). A standard sailing chart (upper right) shows noninterpreted soundings. Charts, with their contours, give mariner 100% information on sea floor, while standard sailing chart, showing only selected soundings, gives about 2% data.

Evaluating Method

The charting specialists must evaluate the method in obtaining data. They must know type of echo sounder, kind of navigational control used, how tracks were adjusted to navigational position fixes, and frequency of fixes.

Sounding Data Sometimes Distorted

Sounding data can be distorted by 'phasing,' the Deep Scattering Layer (DSL), and interference.

Phasing, NOO explains, "is a recording phenomenon that occurs when the distance from the keel of the ship to the bottom is greater than the scale of the depth recorder used." This occurs when the operator of sounding equipment uses a shallow-scale recorder, such as one with a 600-fathom maximum, in deeper waters.

The DSL, a marine life phenomenon, also can cause operators of depth sounders to report shallow areas where, in fact, the ocean

floor is much deeper. The Layer is composed of fish and other small marine organisms. They shun light and rise to surface to feed at night and on dark, cloudy days. They sink into sea's depths at sunrise on bright days. Today's deep-sea sounders can, with good acoustic conditions, observe both DSL and true sea floor. But use of shallow-water echo sounders can result in misinterpretation of the DSL as true sea floor.

Interference results from the transmission of 2 or more sound waves on the same or different ships in the vicinity. When 2 echo sounders run simultaneously, the transmitted pulse "is generally so strong that it is recorded on the other echo sounder, even if the frequencies are different." The result is that the pulse can be interpreted as a measurement, when actually it is a direct wave from the other sounder.

Doubtful Features Charted

Despite meticulous interpretation, the specialists know that all their depth measurements are not accurate. So they will chart a 'doubtful' topographical feature in the interest of safe navigation and not remove it until its existence can be disproved.

This can be done because the bathymetric chart--a contoured map, not one showing thousands of numbers to indicate depths--allows specialists to use all sounding data instead of the 2% shown on standard sailing charts.

NOO concludes: "Continued emphasis on oceanographic programs, including modest but precise survey efforts to fill voids and resolve discrepancies in existing bathymetric data holdings, will not only result in better charts for the navigator but probably is the essential first step toward reaching the goal of 'a more effective use of the sea.'"

Camera Mounted on Diving Vehicle Saves Oceanographers Time

An underwater camera mounted on a Pegasus diving vehicle speeds bottom surveying so much that oceanographers of the U.S. Naval Oceanographic Office (NOO) believe the technique will greatly extend the capabilities of divers.

Chet Bright, who heads the NOO diver-oceanographer group, recently completed a bottom study in the south part of Biscayne Bay, Florida. He reported that divers using a motion-picture camera aboard Pegasus spent about 3 hours in diving time to obtain continuous bottom photographs of a 30-foot by 10-mile track. Bright said: "This is indeed speedy surveying when you consider the tremendous amount of bottom covered. A diver, using conventional swimming techniques, would have to spend weeks covering the same area."

Project SPOC

NOO scientists are working on Project SPOC, a cooperative spacecraft oceanography venture with the University of Miami as part of NASA's Earth Resources Program. They are comparing the photos taken by the divers with those snapped from a NASA aircraft.

The scientists are using the divers' photos as an accuracy base to demonstrate feasibility of observing marine life and charting underwater features in coastal waters through aerial and, eventually, satellite photography.

Biscayne Bay Survey

During the Biscayne Bay survey, one diver-oceanographer in the 3-man team not only operated the camera down to about 3 feet off bottom--but also controlled vehicle along survey track. (See photograph.)

(Photo: James B. Sweeney)

"The controls for the Pegasus are much like those in an airplane," Bright explained. The vehicle, equipped with all instruments necessary to maintain course, also carried floodlights to light area being photographed, and depth sounders to tell diver how far he was from bottom.

The underwater 16 mm. camera is capable of snapping 500 frames per second. To insure accuracy, the oceanographers slowed it to 16 frames per second. The camera is encased in fiberglass and can operate at depths of 300 feet. "Its pictures bring the bottom up to us," Bright stated.

Bright believes that putting a camera aboard a Pegasus vehicle not only will speed bottom surveying, but it also will be useful in "any type of fine grain operation," including checks on underwater cables and geological and biological studies.

Nation's First Estuarine Prediction Service in Maine to be Evaluated

The Nation's first estuarine prediction service, in Maine's Penobscot River and Bay estuary, will be evaluated beginning in April by ESSA's Coast and Geodetic Survey (CGS) to determine its effectiveness.

The service was launched in May 1968 as a one-year pilot program. The Government hopes it will develop into an important service for Government and private agencies in pollution control.

The evaluation will include a circulatory study of the entire Penobscot River and Bay Estuary by the 'Ferrel.' The 133-foot, 289-ton ship is the first to be built in the U.S. specifically to determine circulatory patterns of tidal currents. The study will continue into October 1969. It will also provide more accurate navigational services to yachting, fishing and commercial interests. It will be the first extensive one ever made of the tidal currents in this area.

The survey will help determine how accurate predictions have been in the past year, and provide more data to improve service.

The Prediction Service

Under the estuarine prediction service, advance forecasts are issued twice monthly on the rate possible pollutants pass through the estuary. The forecasts are made by CGS and the Weather Bureau, which furnishes the necessary river discharge forecast and advisory information.

C. R. Muirhead of CGS said the service can be of 'tremendous importance potentially' to commercial and sport fisheries, wildlife conservation and, during the summer months, to recreational activities, especially swimming and boating. "If fully utilized," he added, "this service could enable state and local authorities to institute possible remedial measures to reduce the rate at which potential pollutants are being added to the water."

Survey N. Carolina Seabed

The first detailed large-scale survey of the seabed off the Atlantic Coast between Hatteras and Cape Fear, North Carolina (N.C.), is underway, reports the Coast and Geodetic Survey (CGS).

The 5,000-square-mile survey is being conducted by the 'Peirce,' based at Morehead City, N.C., until May 1969. It will be continued by the 'Mt. Mitchell' from August to October. The survey data will be used for a new bathymetric map of the continental shelf from Wilmington, N.C., to Hatteras, N.C., to be issued within the next 2 years.

Part of Program

The bathymetric survey is part of a long-range program begun off the Atlantic Coast in 1967. The program's purpose is to provide detailed maps of the entire continental shelf, which extends from the shore to a depth of about 600 feet. These maps delineate the sea-floor contours and aid Federal, State, and industrial interests in exploring and developing its vast potential resources.

The Peirce will survey the sea bottom from Cape Lookout to Cape Fear, to the edge of the shelf, while the Mt. Mitchell will work the Cape Lookout-to-Hatteras area.

The Operation

The last bathymetric surveys in this area were made over 40 years ago. These provide general information of the sea bottom for vessels approaching the more shallow areas close to shore. During the current survey, the ships will survey the seabed in detail from 60 feet to the shelf edge. They will determine, for the first time, the detailed configuration of underwater valleys, plains, and

ridges. Existing CGS survey information of shallow waters also will be used for the map. The new data will be incorporated in existing nautical charts of the deep waters.

The hydrographers will use an echo sounder to measure and record depths. These will be determined by the time required for a sound wave produced in the vessel's hull to reach bottom and for its echo to return. The return echo is recorded on a permanent graph at rapid intervals. These form a continuous profile of the sea floor below the moving vessel. The ship's position during surveying will be obtained by an electronic positioning system.

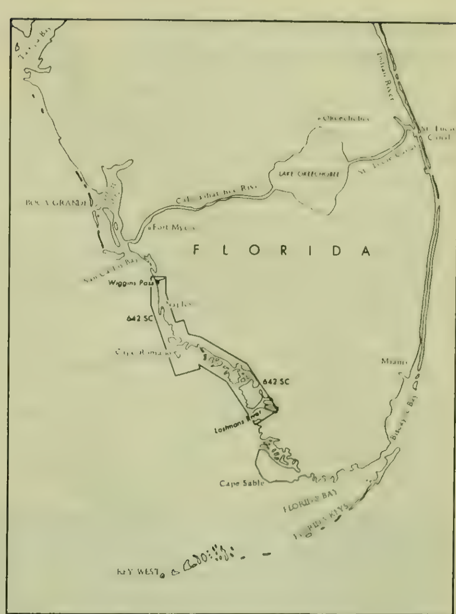
Chart 'Fishermen's Paradise' in Everglades National Park

The Coast and Geodetic Survey has published a new nautical chart that covers in detail a "fisherman's paradise" in a key part of the Everglades National Park.

The area is a favorite for fishermen from south Florida and from hundreds of miles around. Before, fishermen faced the danger of getting lost within minutes in the maze of twisting waterways that cover the subtropical area. The new large-scale chart (1:40,000) will provide the extra detail required to navigate safely.

Area Covered

The accordion-folded, small-craft chart (642-SC) can be readily unfolded in the cockpits of recreational boats. It covers the park's northwest section along the southwest coast of Florida, from Lostmans River to Wiggins Pass, and thousands of mangrove islands offshore. Lostmans River is about 70 miles northeast of Key West, and Wiggins Pass is about 25 miles south of Fort Myers.



'Fishermen's Paradise' in Everglades National Park covered by new nautical chart issued by the Coast and Geodetic Survey.

Color and infrared photography was used to depict the many islands, lakes, and natural channels in this relatively uncharted wilderness area.

The new chart is expected to increase the park's recreational value. Each year nearly 850,000 people visit it. The park contains about 365,700 acres of water surface and over 1,000 miles of rivers and streams.

The chart may be purchased for $1.50 from Coast and Geodetic Survey nautical chart agents, or from Coast and Geodetic Survey (C44), Rockville, Md. 20852.

Can Satellites Be Used to Measure Wave Heights?

Scientists of the U.S. Naval Oceanographic Office (NOO) and the National Aeronautics and Space Administration (NASA) have been testing remote sensors installed aboard an airplane to see if these are capable of measuring wave heights from high altitudes. The area under study was the North Atlantic off Ireland's west coast, where strong winds in late March-early April produce high seas. The scientists are trying to advance the development of all-weather, high-altitude sensors for use aboard satellites.

Clinton Beckner, who headed the NOO team, said that sensors, once developed for satellite use, should measure wave heights in all oceans. The data are needed by ocean forecasters to analyze and predict wave conditions globally. As all-weather sensors, the devices also should give the forecasters continuous data in any weather because the sensors are being designed to penetrate cloud cover.

Value of Remote Sensing

Beckner explained: "Such remote sensing capabilities would make for inexpensive forecasting because the cost of orbiting a satellite is less than that of deploying and maintaining several aircraft that would be needed to provide similar, world-wide coverage." He added that inexpensive and rapid forecasting of wave conditions would have a "tremendous impact" on naval, shipping and fishing operations, and scientific activities. "The Navy, like everyone who uses the seas, could operate in the oceans more effectively if Navy men have a better idea of what wave conditions are going to be in any area of operations." Scientists could learn more about wave growth and decay by studying the wave height data provided on a world basis by satellite sensors.

What Scientists Seek

The scientists are interested primarily in determining if they can record wave heights in heavy seas (more than 18 feet). They learned earlier, in March 1966 near Bermuda, and in April 1968 off Ireland's east coast that the high-altitude sensors can measure wave heights in moderate and low seas.

They installed the sensors--a microwave radiometer and a radar scattometer--in a NASA test airplane. A second plane, a Super Constellation assigned to NOO, was equipped with laser and radar wave profilers. These instruments give reasonably accurate readings from altitudes of 500 to 1,000 feet, but they are not designed to record wave heights from high altitudes.

Both planes took off from Shannon, Ireland, when observers aboard 3 European weather ships stationed 400 miles apart off Ireland reported heavy seas. The NASA plane flew at 20,000 to 50,000 feet, and the NOO plane at 500 to 1,000 feet. On each run, the planes logged 1,200 miles--400 miles from Shannon to the first weather ship, 400 miles to the second, and 400 miles back to Shannon. There, the scientists compared remote sensors' readings with those recorded aboard the NOO plane--and with on-the-spot measuring devices aboard the 3 weather ships.

What's Ahead

Beckner concluded: "If at the end of the five scheduled runs we find that the readings from the remote sensors compare favorably with those taken both by the instruments aboard the low-level Oceanographic Office plane and by the ships' devices, we will know that the sensors, too, can measure wave conditions in heavy seas from altitudes of 20,000 to 50,000 feet.

"Then at a later date, we will try the sensors aboard high-flying aircraft at even higher altitudes and will again fly them over low moderate and heavy seas. If they record wave heights in the three types of seas at these still higher altitudes, we will be ready to test them on a satellite."

Foreign Fishing Off U.S. in February 1969

NORTHWEST ATLANTIC

Bad weather and severe snowstorms hampered surveillance in February. However, 182 individual fishing and support vessels from the USSR, Poland, and Japan were sighted, considerably more than the 70 seen in January.

Soviet vessels increased from about 50 early in the month to about 150 by the end. In Feb. 1968, only 53 Soviet vessels were sighted between Nantucket and the Virginia Capes. Twenty-one Polish and 2 Japanese vessels were seen in Feb. 1969.

Off Southern New England

About 15 Soviet factory stern trawlers were sighted south of Nantucket to south of Block Island, R.I., in ICNAF Sub-area 5, just beyond the eastern boundary of the 'no fishing' zone. Catches were primarily red hake, with some herring and whiting. About the same number of Soviet stern trawlers fished the same area in Feb. 1968.

Off Midatlantic

Soviet: The fleet increased from 25 to 50 vessels in Jan., and 60 more arrived in first week of Feb.

This year's fishing pattern is quite different from last year's, when the large buildup did not begin until March. In 1968, the fleets were mainly large factory stern trawlers, but in 1969 most were medium trawlers. This change in vessel-type and fishing season indicates the Soviets are seeking different species this year than in 1968.

In early Feb., 50 medium trawlers and 3 'Slava' class processing motherships were spread in an irregular line 70-80 miles long off southern New Jersey, from Barnagat Lightship to south of Cape May. Equipment

Fig. 1 - Empty barrels (on platform above stern) will be used to store salted herring in the refrigerated holds of the base ship 'Trudovaya Slava,' built in West Germany in 1967. (U.S. Coast Guard)

on all vessels was lashed down, decks were awash, and the fleet seemed to be weathering out a storm rather than fishing. No catches were observed.

Moving south toward the Virginia Capes, this fleet was joined by enough other vessels to double its size. By the second week in Feb., 112 fishing and support vessels had been sighted.

Fig. 2 - With a side-trawler nestled alongside, the Polish base ship Pomorze supports the fleet fishing herring off the coast of Virginia. The photo was taken from a U.S. Coast Guard surveillance plane on February 8, 1969. (U.S. Coast Guard)

Eighty-nine were seen about 50 miles east of Norfolk, Va., in a 35-mile-long area from Cape Charles to south of Cape Henry. Another 7 trawlers fished herring about 40 miles east of Chincoteague Island, Va. Moderate catches were seen on decks. Eleven other trawlers fished herring east of Cape May, N.J. A few vessels scattered between these groups were probably in transit or searching for fish schools. The groups, mostly medium trawlers, were supported by 5 modern processing motherships. Two stern factory trawlers sighted off Norfolk might have been doing exploratory fishing. Moderate-to-excellent hauls of sea herring were observed.

After midmonth, 69 Soviet vessels, including 10 support vessels, were sighted off Fire Inlet, N.Y., and as far south as Atlantic City, N.J. Most were fishing in 15-20 fathoms, 20-30 miles offshore. Moderate catches appeared to be herring; 1 stern trawler fished red hake. About 35 vessels fished off Currituck, N.C. By Feb. 25, the fleet off New Jersey had joined the Currituck fleet off Cape Hatteras, where Soviet exploratory vessels had discovered large herring schools.

Polish: In early Feb., about 12 vessels supported by a mothership, the 'Pomorze,' fished in the Mid-Atlantic Bight. Although operating independently, Polish fishermen kept close to the Soviet fleet, which supplies them with fishery intelligence--location of fish schools, information on fishing grounds, weather reports--and sometimes supplies, water, and fuel.

Early in the month, 3 trawlers were sighted huddled together riding out a storm about 40 miles off Cape May. On Feb. 13, 12 trawlers, with 7 Soviet trawlers, fished 40 miles east of Chincoteague. By the 20th, 13 Polish trawlers were scattered among a large group of about 70 Soviet vessels, from south of Long Island to east of Atlantic City. All Polish vessels were side trawlers, except for 1 stern trawler. Catches on side trawlers were herring; no catches were seen on the stern trawler.

Japanese: Two stern trawlers were sighted. On Feb. 4, 1 was sighted 65 miles southeast of Cape May, and on Feb. 20, 2 were seen in the Hudson Canyon area. Each time they were in the U.S.-USSR 'no fishing'

zone. No catches were noted. Representations have been made to the Japanese Government concerning abstention of fishing in this zone. The Japanese press reports that about 9 vessels will continue 'exploratory' fishing in the area during 1969.

U.S.-USSR Midatlantic Agreement

No Soviet vessels were observed in the 'no fishing' zone. Only 2 were seen in the Long Island loading and unloading zone.

Violations of U.S. Fishing Limits

On Feb. 8, 20 foreign fishing vessels were sighted inside the 9-mile contiguous zone. Eleven Polish and 4 Soviet vessels had fishing gear in the water. By the time a Coast Guard patrol arrived, all the vessels had moved beyond the 12-mile limit. The Polish fleet commander aboard Pomorze was warned that a repetition of the offense would result in seizure of the violating vessels. A few days later, most of the Soviet fleet had moved 40-50 miles offshore.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign fishing vessels were reported.

OFF CALIFORNIA

No foreign vessels were observed fishing in Feb. The last report of foreign fishing here was in Nov. 1968.

OFF PACIFIC NORTHWEST

Japanese: One longliner was sighted; no catches were observed. In Feb. 1968, 7 vessels, including 2 long-liners, were seen in the area.

Soviet: The first fishing vessel sighted in 1969 was a side trawler off Cape Flattery, Wash., in the second week of Feb. Fishing off Oregon in the third week, it was joined by another side trawler, and by a stern trawler in the fourth. In Feb. 1968, 13 vessels were sighted.

OFF ALASKA

Soviet: Vessels increased from 130 in late Jan. to 160 in Feb. The growth was in the flounder and groundfish fleets in the eastern Bering Sea. About 100 vessels were sighted in Feb. 1968.

The eastern Bering Sea flounder fishery followed the pattern of previous years, when vessels increased from 50 to 70 during Feb. At month's end, there were 25 factory trawlers, 30 medium trawlers, 13 factory vessels and refrigerated transports, and 2 support vessels.

The herring fleet--about 25 factory trawlers, 30 medium trawlers, 12 factory and refrigerated transport vessels and 3 support vessels--remained northwest of the Pribilofs in central Bering Sea throughout Feb.

Fig. 3 - The 571-foot long Soviet base or factory ship 'Spassk' nested with a tanker (visible in picture) and a refrigerated transport, a stern trawler, and a tug (only masts shown in picture) in ice pack in central Bering Sea. These ships are part of the approximately 70-vessel winter herring expedition off Alaska. (J. Branson)

Twelve medium trawlers fishing groundfish--primarily arrowtooth flounder and sablefish--off the Continental Shelf edge, north of the Aleutians in the eastern Bering Sea, were joined by 6 more medium trawlers. The latter fished in shallower waters, primarily catching Alaska pollock. Two refrigerated processing transports supported them.

Japanese: The fleet, about 40 vessels in late Jan., decreased to about 30 by end of Feb. This was about 25 fewer than in Feb. 1968.

Four stern trawlers fished ocean perch in the Gulf of Alaska during first half of the month; only 2 remained at the end. Four stern trawlers fished ocean perch along the Continental Shelf in eastern Bering Sea through the month.

Six trawlers, one factoryship, and 1 reefer fished flatfish and Alaska pollock in eastern Bering Sea. At least 2 factoryships en route from Japan were expected to increase effort in this fishery in early March.

The herring fishery northwest of the Pribilofs (close to the Soviet herring fishery) continued through the month, with 10 stern trawlers, 2 medium trawlers, and one factory ship.

Six to 8 longliners fished sablefish in the Gulf of Alaska during first 3 weeks. Effort began to decline during the last week and, by month's end, only 1 or 2 vessels remained.

IMPROVING UNDERWATER EXPLOSIONS

The vibrations produced by controlled underwater explosions are useful in such diverse tasks as prospecting for oil and developing new underwater communications systems.

Just dropping a few bombs over the side, however, won't do the trick, especially for the prospectors, who need extremely precise shock waves to examine soil and rock strata beneath the water. The trouble is that a charge set off at great depth or near the bottom creates a large bubble at the moment of explosion. This bubble pulsates as it rises to the surface, with an action similar to that of a taut spring which is suddenly released. The pulsations in turn cause secondary disturbances which interfere with the recording of the main shock wave.

One way around this is to put the explosive charge in a perforated sphere, which causes the bubble to break up into smaller bubbles that do not disturb the seismic recordings. This, however, poses the problem of reloading the sphere somehow when a series of successive explosions are necessary, as is often the case. Recently, two approaches to the problem have been patented--one from France and the other from the U. S.

The French method is simply to trail the perforated sphere from the end of a long tube leading to the deck of a ship. The explosive charges are dropped down the tube and set off with timers or depth sensors. One variation is to pour explosive ingredients down the tube to the sphere, then set them off with electrodes.

The American approach does away with the perforated sphere. Instead, a highly-conductive liquid is poured into the water between a pair of electrodes, which vaporize it into a superhot plasma. This forms a huge bubble of hot steam which then collapses to produce shock waves that are predominantly low-frequency. The increased low-frequency content helps obtain data from as far as several miles below the water bottom. (Reprinted with permission from "Science News," weekly summary of current science, copyrighted 1966 by Science Service, Inc.)

STATES

California

FISH & GAME DEPT. ISSUES
1968 ANNUAL REPORT

The 1968 annual report of California's Department of Fish and Game, which appears in 'Outdoor California' March/April 1969, reflects the Department's extensive activities in the fisheries. Here are some highlights:

I. INLAND FISHERIES

In 1967-68, its fish hatcheries "produced 39,248,896 resident, anadromous, and warmwater fish weighing a record 2,705,759 pounds." Of this total, 25,384,457 were trout and kokanee, 13,604,310 salmon and steelhead, and 260,129 warmwater fish.

The Department planted 900 back country lakes by air with 6 million fingerling trout. It was this program's 20th year. Aerial planting "has reduced the cost of planting from \$18.75 to \$1.43 per thousand fish."

The proposed warmwater hatchery site in Imperial Valley was tested successfully. The Department will build this facility to raise 500,000 one-half-pound channel catfish a year to stock southern California waters.

Proceeding on schedule is construction of the \$2.2 million Mad River Salmon and Steelhead Hatchery. It will be completed this year and produce 1,000,000 yearling and 5,000,000 fingerling salmon and steelhead to stock north coast streams.

Valuable Research Information

The annual report states that several research projects have produced valuable information on fishery management. For example:

"The Salton Sea study disclosed that a salinity of about 40 parts per thousand is the maximum tolerated by eggs and young fish. This means that the increasing salinity of the sea must be controlled before it reaches this level, to protect the great fishery there."

Sturgeon tagging will enable the Department to closely watch the rising catch of sturgeon and determine management needs.

A large striped bass tagging program is expected to gain information on the "total population, recruitment, harvest, and natural mortality of this fish."

A coldwater reservoir study "determined the optimum size and strain of trout fingerlings and the best time to plant for maximum returns." This will enable biologists to provide better trout fishing at lower cost.

II. MARINE RESOURCES

The 1968 commercial fish catch was expected to drop 10% from 1967 landings of 503 million pounds. This would reflect lack of anchovy fishery during early 1968 and drop in skipjack landings from 1967's high level. "Tuna landings account for over half the catch, as is the usual case."

Eight Department-tagged bluefin were recovered off Japan--and 2 Japanese-tagged bluefin off California. "This indicates Japanese and America fishermen are harvesting the same stocks."

"The crab resource appears to be coming back in the San Francisco area and is healthy off the North Coast."

Estimates of the shrimp population were high enough to permit a quota increase from $1\frac{1}{2}$ to 2 million pounds during 1968.

Exploration for prawns showed populations large enough "to support moderate fisheries off Monterey and Catalina."

Anchovies

During last season, the reduction fishery landed "only 6,500 tons of anchovies," nearly all from Monterey Bay. "Low landings were due chiefly to adverse economic conditions and the failure of commercial size schools to form in near-shore waters."

Since March 1966, 369,300 anchovies were tagged, 178,700 in 1968; 755 tags were recovered, 240 in 1968.

Live Bait

Reported live bait landings were expected to reach a record 7,000 tons. This is

"primarily because of improved contact with fishermen and better catch reports."

Sea Otters

Censuses revealed 576 sea otters between Monterey Bay and Morro Bay.

A legislature-authorized sea otter project was begun. Its purpose is "to reduce competition for abalone." Sea otters will be trapped where commercial fishermen harvest red abalone and be transported to the sea otter refuge.

III. SALMON & STEELHEAD

Because of "continued declines in fishery landings and spawning runs of Central Valley king salmon stocks," the Department recommended sport fishery restrictions to the Fish and Game Commission.

The Department emphasized that "the salmon decline is not the fault of sport or commercial fishermen, but rather is a combination of problems which have reduced the survival of young salmon. These factors included unscreened irrigation diversions, gravel siltation and removal, predation, pollution, vegetation encroachment on spawning riffles, inadequate water flows, and fluctuations of water temperatures due to natural or other causes."

The salmon fishing restrictions recommended by the Department are designed "to prevent further declines in salmon stocks until we can solve the long range problems facing the resource."

Salmon Landings

Commercial salmon landings for 1968 were estimated at 7 million pounds, a half-million below 1967.

The ocean sport catch was estimated at 176,000 salmon; it was 126,000 in 1967.

Sacramento River sport landings were estimated at 17,000 king salmon and 19,700 steelhead.

Oregon

WILLAMETTE STEELHEAD POPULATION INCREASED IN STATE PROGRAM

The Oregon Fish Commission has announced that more than 3,500 adult winter steelhead were transplanted into Willamette River tributaries during December 1968 and January-February 1969 in the third year of its program to develop the Willamette system's natural spawning potential for winter steelhead.

The early-run fish were surplus to egg-take requirements and stream needs at the commission's Big Creek and Klaskaine hatcheries. The fish were trucked and released into Willamette Valley streams devoid of winter steelhead or having only a few.

Adult-Hauling Program Successful

Success in the adult-hauling program was verified recently by a survey of spawning nests (redds) on 4 of the planted streams.

Earlier counts over Willamette Falls seemed to substantiate success of attempts to introduce an early run. The first winter steelhead passing the counting chamber at Willamette Falls' new fishway was recorded on Sept. 22, 1968; by the end of Dec. 1968, over 2,500 steelhead had been counted over the falls. In past years, no significant number of steelhead had been recorded over the falls prior to January or February.

Another Program Helped Too

The earlier arrival of steelhead at the falls, however, results partly from another Fish Commission program. In 1968, in an effort to establish an earlier run and develop unutilized natural spawning areas, the Fish Commission completed an extensive 4-year steelhead smolt liberation program on the Yamhill River. During the past 2 years, spawning adults from these plants also have been verified by Fish Commission biologists.

The Commission states that development of an early run of winter steelhead is desirable. Steelhead fishing could be spread over a longer period, and 'the sportsmen given a bonus run to go after before the wild stocks of steelhead and spring chinook hit their peaks.'

* * *

GOVERNOR DEDICATES ULTRAMODERN ELK RIVER SALMON HATCHERY

Governor Tom McCall formally dedicated on April 18 the Oregon Fish Commission hatchery at Elk River. The dedication capped 3 years of planning and construction in cooperation with BCF.

The hatchery is near Port Orford. The planners made it attractive and functional--without disturbing the site's natural beauty. All electrical hookups were laid underground. Unobtrusive pumping systems carry water to the rearing ponds.

The Hatchery

The hatchery will provide the salmon stock for the major tributaries of southern Oregon. Plans call for rearing about 1 million fish in the first year: 850,000 fall chinook and 150,000 coho. Liberation is planned for the Elk and Chetco systems and the Floras Lake area.

Hatchery fish will be kept in rearing ponds as long as they normally would spend under natural conditions in the streams. Then they will be liberated and return directly to the sea. This will ensure that hatchery fish do not compete with wild fish in the streams; it will allow natural spawning to continue under "the most fruitful circumstances." The Commission states: "Couple the hatchery migrations and the natural migrations, and the outlook for total southern Oregon fish production assumes exciting proportions."

The equipment will feature Burrows rearing ponds. This design keeps the water circulating in the ponds at all times and the fish swimming. The result is much stronger fish with greater endurance. This leaves little opportunity for sick fish to congregate in quiet water.

The ponds are self-cleaning and are expected to result in a much higher survival rate. Also, adult holding ponds have been built with a fishway and support buildings housing freezer storage of the "Oregon Pellet," shop, garage, electrical control equipment, and incubation room. A stream bed filtration system will draw water from the river and carry it to the hatchery ponds. So continuous circulation essential to healthy hatchery programs will be provided.

Continuing Research

Continuing research will play a part. Studies of the early life history of the fall chinook in the area will be undertaken. A biologist will work in the Elk and Sixes areas. Overall potential of the Curry County streams will be under continuous scrutiny. Complete cost of the Elk River hatchery, the 15th under Fish Commission jurisdiction, was $476,000. This includes the hatchery facility and 3 houses for personnel and families.

Texas

8,000 TAGGED SHRIMP RELEASED

BCF and the Texas Parks and Wildlife Dept. released 8,000 tagged brown shrimp off the upper Texas coast during February and March. BCF is offering a reward of $2 for each tagged shrimp returned along with information on where and when it was caught.

Biologists will use information collected from this experiment "to estimate shrimp abundance, winter survival, and spawning potential of brown shrimp remaining on the grounds."

Growth rates and movements of shrimp also will be studied. This information will help to determine the effects of fishing on shrimp stocks and the proper timing of the shrimp harvest to insure maximum annual catch.

Tag

The tag consists of 2 small green disks held on either side of the shrimp's tail by a slender wire, which passes through the shrimp. Fishermen who catch these tagged shrimp should freeze or preserve the entire shrimp along with the tag.

BCF personnel will visit shrimp houses regularly to collect tagged shrimp and pay rewards. Rewards will not be paid unless information on exact location and date of capture are recorded.

* * *

A Preliminary Review of the Potential Deep-Water Fishery Off Texas Between 50 and 300 Fm.

R. Spencer Gaille

The Texas Parks and Wildlife Department commenced systematic bottom trawling between 50 and 300 fm. off the Texas coast in July 1967. The primary objective was to determine the abundance, distribution, and seasonal occurrence of royal red shrimp, Hymenopeneus robustus, and potentially valuable industrial fish species. A need exists for supplemental fish and shellfish raw material during seasons or years when commercial quantities of brown and white shrimp are not available.

The 'Western Gulf,' a 72-foot steel shrimp trawler, was used to conduct the preliminary field tests. It is equipped with standard oceanographic instruments and winches capable of trawling to depths of 500 fm. Shrimp trawling gear consisted of a single 45-foot, $2\frac{1}{4}$-inch, nylon stretch mesh flat otter trawl.

ROYAL RED SHRIMP

Results of deep water work by the 'Oregon' (Springer and Bullis, 1956, Bullis and Thompson, 1965) indicated that commercially exploitable quantities of royal red shrimp were not available off the Texas coast. Their catches of 5-30 pounds per 3-hour drag with 80- and 100-foot trawls southeast of Port Aransas, Texas, were extremely small when compared with catches of 90-120 pounds per 3-hour drag east of the Mississippi Delta. However, the Oregon occupied only 30 trawl stations off Texas in the depth zone inhabitated by royal red shrimp. The small number of stations occupied suggests that further trawling effort is needed.

The maximum yield per 2-hour tow in over 75 attempts by the Western Gulf was 25

Photo: Texas Parks & Wildlife Dept.

Mr. Gaille is a Marine Biologist, Texas Parks and Wildlife Dept., Rockport, Texas.
This study was conducted in cooperation with BCF under PL 88-309 (Project 2-47-R).

pounds; usually less than 5 pounds was caught. These results, then, substantiate those of the Oregon.

FISH OF INDUSTRIAL OR MARKET VALUE

Three species of trawl-caught demersal fish were taken in samples from 50 to 100 fathoms, the wenchman snapper (Pristipomoides andersoni), the scalyhead scorpionfish (Pontinus longispinis), and the spotted hake (Urophycis regius).

The wenchman snapper varied in weight from $\frac{1}{4}$ to $\frac{3}{4}$ pound and averaged $\frac{1}{2}$ pound. It possesses the typical qualities of a panfish having firm flesh and above-average taste. Mosely (1965) did some unpublished age determination research on wenchman from the Gulf of Mexico. Little else has been done on its life history or commercial possibilities.

This small reddish snapper schools over rough and mud bottom. Individual fish are believed to be scattered thickly along the bottom with dense circular schools often extending upward 20 feet. Over 400 pounds were caught in a 2-hour drag at a depth of 80 to 90 fathoms east of Port Isabel, Texas, in November 1967 with a 45-foot, 3-inch stretch mesh fish trawl. There are no estimates of catching efficiency of the 45-foot standard shrimp trawls which produce sizable catches of wenchman at times. While this type of net is not adapted to the capture of bottom dwelling fish, catches do indicate the availability of several fish species which may warrant further explorations with suitable gear for a gross determination of abundance.

Scalyhead scorpionfish, averaging $\frac{1}{3}$ pound, were common from 70 to 130 fathoms. Spotted hake, which averaged $\frac{1}{2}$ pound, were narrowly confined to the 90-fathom zone.

Table 1 - Numbers, Weights, and Lengths of Wenchman Snapper, Scalyhead Scorpionfish, and Spotted Hake, Taken in 1-Hour Trawls at Depths of 40, 50, 70, 90, 130, and 165 Fathoms with a 45-Foot, $2\frac{1}{4}$-Inch Stretch Mesh Trawl East and Southeast of Port Aransas in July and October 1967

Depth	Wenchman Snapper			Scalyhead Scorpionfish			Spotted Hake		
	No.	Lb.	Length mm.	No.	Lb.	Length mm.	No.	Lb.	Length mm.
40	0	-	-	0	-	-	0	-	-
50	50	25	120-210	0	-	-	0	-	-
70	75	35	120-200	25	9	130-200	0	-	-
90	100	48	110-200	50	17	90-150	30	15	220-450
130	10	5	120-170	30	12	110-170	0	-	-
164	0	-	-	0	-	-	0	-	-

Only small number of the Gulf silver hake (Merlucius magnoculus) were caught in 1967. Subsequent efforts in 1968 produced generally the same findings with the Gulf hake, U. cirratus, continuing to be the predominant species between 130 and 300 fm. Table 2 provides catch information and depth distributions for the 2 species in 1967.

Table 2 - Numbers, Weights, and Lengths of Gulf Hake, and Gulf Silver Hake Taken in 1-Hour Trawls at Depths of 130-300 fm. with One 45-Foot, $2\frac{1}{4}$-Inch Stretch Mesh Trawl East and Southeast of Port Aransas in July and October 1967

Depth	Gulf Hake			Gulf Silver Hake		
	No.	Lb.	Length mm.	No.	Lb.	Length mm.
130	32	37	150-320	8	4	160-225
165	58	40	110-460	2	1.5	190-220
200	84	40	240-510	3	2	205-380
250	10	12	240-310	6	6	200-310
300	15	18	250-500	11	8	300-380

SUMMARY

Royal red and associated deep water penaeid shrimp have been found in only small numbers during explorations of the 200-300 fm. depth zone. The commercial fishery potential of these shrimp in deep water off the Texas coasts is doubtful.

Wenchman snapper are excellent panfish, and are known to inhabit the 50-100 fm. depth interval. Further investigations directed to determining abundance might be practicable because it is a commercially interesting species that may exist in commercial quantities.

Similarly, beyond 100 fm. the Gulf hake (Urophycis cirratus) may exist in quantities suitable for commercial harvest. This species is less desirable than wenchman snappers in terms of palatability; it would probably be considered as an industrial species if and when it is commercially utilized.

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LONGLINING FOR SWORDFISH IN THE EASTERN PACIFIC

Susumu Kato

'Blue Belle' returned to Morro Bay, California, early in February 1969 with a load of broadbill swordfish (Xiphias gladius) caught by longline gear. She was the first California-based commercial vessel to attempt longlining for swordfish on a large scale. Captain Wayne Smith became interested in trying this method of fishing after learning of a successful longline trip by the BCF research vessel 'David Starr Jordan' in November 1968. Upon learning of his interest, the Bureau loaned its gear to Blue Belle and she sailed with a crew of four on January 16 from San Pedro, California.

Fishing Gear and Methods

Blue Belle is 55 feet long with a beam of 14 feet, and has a refrigerated holding capacity of 15 tons. The components of BCF longline gear used by Blue Belle are shown in figure 1. This gear was patterned after that used by east coast American and Canadian fishermen. A radio transmitter, a radar reflector, and a flashing-light buoy aided in the recovery of the gear. Flag buoys were spaced at five-float intervals. Specially constructed boxes (fig. 2) facilitated handling and storage of dropper lines and hooks. A hydraulic reel,

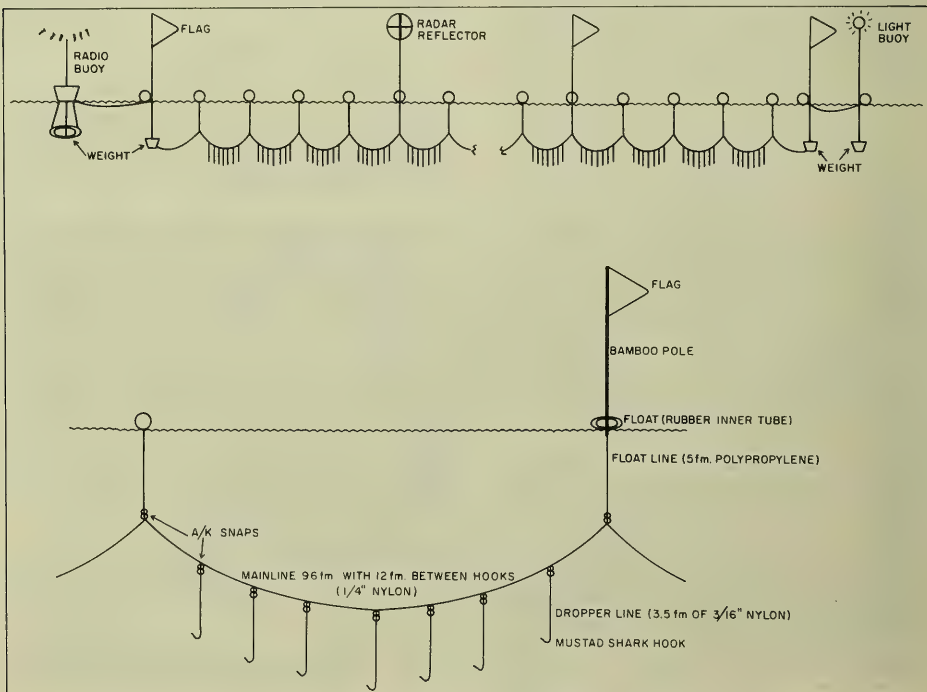

Fig. 1 - Longline gear used for taking broadbill swordfish.

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powered with an automobile transmission and a chain drive (fig. 3), was used to haul and store the mainline. Bait consisted principally of frozen jack mackerel, Trachurus symmetricus.

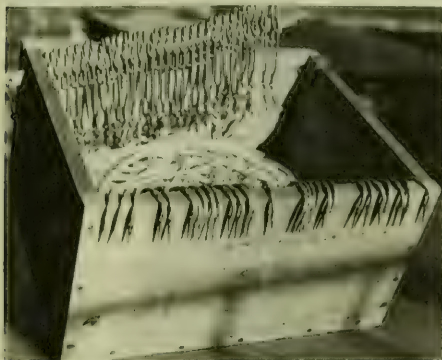

Fig. 2 - Dropper line storage box, with hooks ready to be baited.

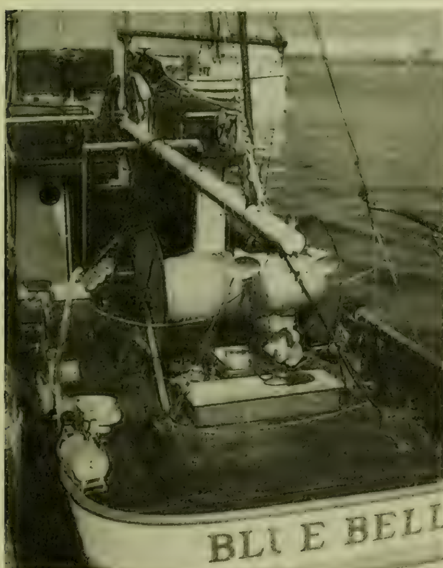

Fig. 3 - Powered reel for the mainline used by Blue Belle.

To set the longline, the vessel was steered downwind at about 3.2 knots and the line allowed to pay out freely. One man baited the hooks and threw them overboard, while passing the snap ends to a second man who attached the dropper lines to the mainline. A third man handled the floats and flags, while the captain kept the ship on course.

During retrieval of the line, one man controlled the speed of the reel and unsnapped the dropper lines as they came aboard, two men coiled the dropper lines in the storage boxes and handled sharks, while the captain maneuvered the ship. All hands aided in landing swordfish.

All sets were made just before sunset, and hauling was started at dawn. Ten sets (total of 4,208 hooks) were made in international waters offshore from central Baja California, near the 1,000-fathom contour. Surface-water temperatures in this area--67.5 to 70.5° F.--were determined from a bathythermograph cast made before each set.

The Catch

A total of 33 swordfish were caught (figs. 4 and 5), of which one was lost due to extensive damage by sharks. The catch rate of the entire trip was 0.8 swordfish per 100 hooks fished. Every set produced at least one swordfish; the best day's catch was nine fish on a 392-hook set. The total dressed weight of the landed swordfish was about 2.5 tons (average weight 156 pounds). The fork length (tip of lower bill to fork) of the fish ranged from 36 to 109 inches (dressed weights 20-360 pounds). Gonads of 29 fish collected by the fishermen indicated that 93 percent of the fish were females. None of the ovaries were in an advanced stage of development.

Other fish in the catch included one striped marlin (Tetrapturus audax), a few dolphin (Coryphaena hippurus), about 1,500 blue sharks (Prionace glauca) and 83 other sharks representing five species.

Future Prospects

The large number of blue sharks encountered presented the greatest problem to the fishermen. The sharks caused extensive tangling, often cut the mainline, and slowed hauling to an average of 80 minutes per 100

Fig. 4 - Unloading swordfish at San Pedro.

hooks. Further, their competition for bait appreciably decreased the baits available to swordfish. The abundance of sharks also limited the amount of hooks Blue Belle could set to about 350 rather than the anticipated 800 to 1,000 hooks per set. Despite the problems with sharks, the catch rate of 0.8 swordfish per 100 hooks was encouraging.

Captain Smith is preparing for a second longlining trip. Another vessel will probably enter the fishery shortly. Both vessels will carry gear on loan from BCF. Although availability of swordfish may be relatively low at this time of year, the high price paid for

Fig. 5 - Part of the catch.

the fish will compensate somewhat for low catches.

Longlining for swordfish seems especially suitable for the large albacore jig boats, which are readily adapted to this type of fishing. This fishery may be particularly attractive to albacore fishermen because swordfish apparently are available in greatest numbers from October through January, and the albacore season usually terminates around late October. Little is known about the availability of swordfish from February through August.

Annual California landings of swordfish have never exceeded 250 tons since the peak year of 1948, when 550 tons were landed. Swordfish have been caught exclusively by harpooning, which requires good weather and availability of fish on the surface; thus, harpooning is restricted to about 4 months, from July through October. Swordfish could be harvested for an additional 3 months or more by longlining.

METHOD FOR PROTECTING LAKE TROUT TAKEN IN TRAWLS

Alfred Larsen and Warren Handwork

A rescue device for returning live fish to below-surface depths was used to increase survival of lake trout (Salvelinus namaycush) caught during BCF exploratory trawling in Lake Superior. Lake trout stocks, now being rehabilitated in Lake Superior and other Great Lakes after near extinction by the sea lamprey (Petromyzon marinus), cannot be fished commercially at the present time. The development of an effective method to return live fish to their habitat was prompted by incidences of losing trout to predation by gulls when the fish were released on the surface after their removal from the trawl net. Many lake trout were unable to swim down from the surface upon release because air bladders expand at lower pressures as fish are brought to the surface. Trout that had been returned to the lake often were observed swimming at or near the surface for long periods trying to submerge. During these periods the fish are extremely vulnerable to preying gulls. In 1967, the trout rescue cage was tested successfully aboard the chartered commercial trawler 'A. E. Clifford' during exploratory trawling in Lake Superior.

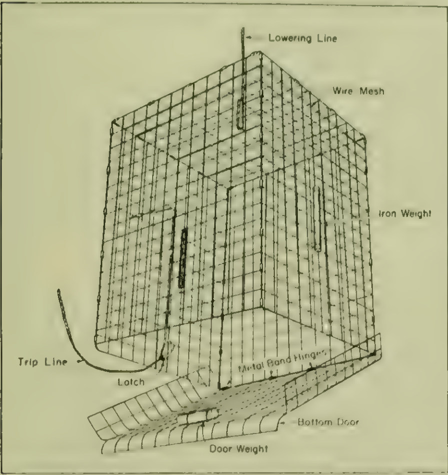

Fig. 1 - Construction details of rescue cage used in underwater method of releasing lake trout.

EQUIPMENT

The trout rescue cage is a rectangular wire-mesh container, which measures 2 by $1\frac{1}{2}$ by $1\frac{1}{2}$ feet, constructed of 1-inch square mesh, 14-gauge, galvanized wire (figs. 1, 2, 3, and 4). The interior of the cage was later lined

Fig. 2 - Fisherman placing a lake trout into the rescue cage.

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Fig. 3 - Lake trout in the rescue cage about to be lowered into the water.

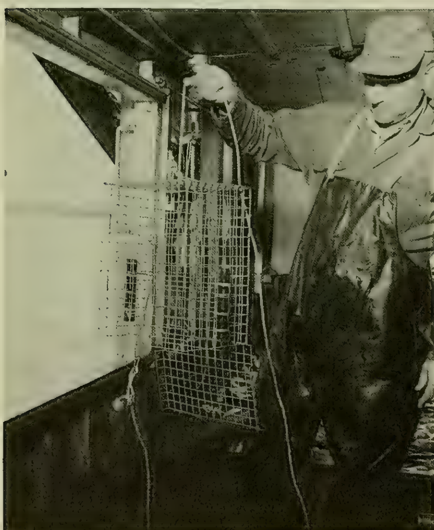

Fig. 4 - The rescue cage after fish have been released.

with $\frac{1}{4}$-inch square mesh hardware cloth to retain small trout. The bottom panel of the cage is hinged and held closed by a spring wire formed into a latch fastened to a side of the cage. A $\frac{1}{4}$-inch nylon line is used to disengage the spring-wire latch that opens the bottom door for releasing the fish. Another $\frac{1}{4}$-inch nylon line, tied to the center of the top of the cage, is used for lowering the cage to the desired depth. A 6-ounce lead weight, which is fastened to the bottom panel on the side opposite to the hinges, furnishes the force needed to pull the panel open when the latch is released. Two 1-pound iron pipe weights are lashed to opposite sides of the cage to help sink it faster.

PROCEDURE

Trout captured in the trawl are immediately sorted from the catch and placed in a 30-gallon recovery tank with circulating water (fig. 2). When the fish appear to be in good condition (swimming normally), the vessel is stopped. The trout are then placed in the rescue cage, lowered to a depth where water pressure is greater (thus recompressing the inflated air bladders), and released (figs. 2, 3, and 4). The trip line must be kept slack when lowering the cage to prevent releasing the fish prematurely. Trout having excessively bloated air bladders are "deflated" before they are placed in the cage by applying slight pressure in the belly area, or by inserting a hypodermic needle carefully into the air bladder to remove the air. The latter technique has been used successfully on blue rockfish (Sebastodes mystinus) and ocean whitefish (Caulolatilus princeps) in California (Gotshall, 1964) and on lake trout in Wisconsin (Hacker, 1962).

RESULTS

From January 16 to June 8, 1967, over 100 trial releases of lake trout from the rescue cage were made. Extended visual surface observations after each release revealed that under 10 percent of the trout returned to the surface where they could be attacked by gulls. We found that lowering the rescue cage to a depth of about 30 feet was most successful in keeping the fish down after their release. Observations by means of underwater television showed that upon release the trout dispersed downward from the cage.

CONCLUSIONS

A trout rescue cage, tested during BCF exploratory fishing in Lake Superior, increased the survival of trout that were caught in trawls and brought aboard the fishing vessel. The rescue cage is used to return live lake trout to below surface depths where inflated air bladders become recompressed to help the fish stay submerged. The method was successful in reducing the amount of sea gull predation that occurred when numbers of fish remained on the surface when thrown overboard after removal from trawl catches.

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OYSTERS OPENED BY MICROWAVES

BCF scientists have developed a technique to open oysters by using microwaves. The oysters are exposed to enough microwave energy to open them--but not enough to cook them. When open, they are easy to shuck.

Persons who ate the oysters could find no difference in "flavor, odor, or appearance" between microwave-treated oysters and those shucked normally.

The oyster-shucking industry may be changed drastically because the new technique eliminates the need for expert hand shuckers of which there is a shortage. BCF is striving to refine the process and to extend its use to other shellfish that are difficult to open.

A BCF scientist tests the microwave technique for opening oysters or clams.

--Harold Allen

SOUTH KOREAN FISHERIES OFF ALASKA

Virgil N. Crosby

After a disastrous expedition by the Samyang Fisheries Co. in 1967, the same fleet returned to Alaska in 1968 with the addition of one refrigerated support vessel. A second company, the Korean Marine Industry Development Corp., made its initial venture in 1968 to the grounds off Alaska. It sent one stern trawler on 2 expeditions to the eastern Bering Sea. Production, mostly walleye pollock, was low.

The first interest by the Republic of Korea in fishing the grounds of the northeast Pacific Ocean and eastern Bering Sea was demonstrated in 1966. A single exploratory vessel worked along the Aleutian Islands, in the eastern Bering Sea, and into the Gulf of Alaska as far east as Kodiak. In fall 1967, the Samyang Fisheries Co. sent a refrigerated processing and support ship and 8 pair trawlers to the fishing grounds off Alaska. Enroute, 2 trawlers and 29 crew members were lost in a violent storm south of the Aleutian Islands. This tragedy was compounded by adverse climatic conditions that plagued the fleet for its entire stay. Catches were small, primarily walleye pollock (Theragra chalcogrammus). The fleet returned to Pusan in mid-November and landed only a few tons of fish; the rest was eaten by the crew. The 1967 expedition resulted in financial, vessel, and human losses.

In 1968, the Samyang fleet--the 957-gross-ton 'Sam Su No. 301' and the remaining 6 pair trawlers, the 'Sam Su Nos. 2, 3, 5, 6, 9, and 10,' returned to the grounds off Alaska in early May. They were joined in early June by the 'Sam Su No. 201,' a refrigerated transport of 828 net tons. The principal fishing grounds were around the Fox Islands in the eastern Aleutians, and west of the Pribilof Islands in the Bering Sea. The Samyang fleet departed the Alaskan area in mid-July 1968 and returned to Korea with over 800 metric tons, mostly walleye pollock with some flounder and cod.

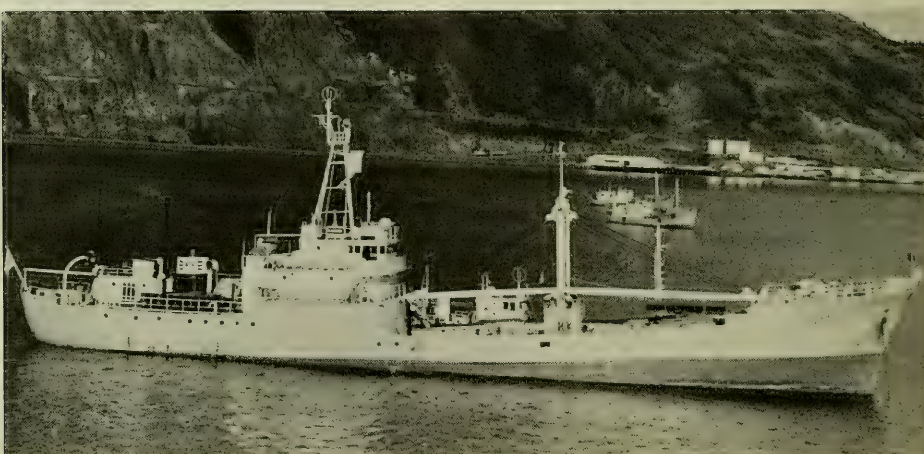


Fig. 1 - South Korea's Sam Su No. 301, anchored at Kodiak, Alaska, was built in Japan in 1956. She and her fleet of trawlers were part of war reparations by Japan to Korea. The ship is 213 feet long and carries 67 men.

Mr. Crosby is Fisheries Management Agent, BCF, Office of Enforcement and Surveillance, Kodiak, Alaska.

The Koreans had hoped to catch herring but were unable to find any. As in 1967 the fleet was beset by technical troubles, although minor compared to 1967. One trawler ran aground, several experienced mechanical difficulties and one hit an iceberg.

In early June the 6 trawlers were authorized to enter Akutan harbor while their support vessel sailed to Sand Point to pick up new radio equipment. Several crew members went ashore illegally and were fined US$10,000 by the U.S. Immigration Service.

BCF Agents Visit

BCF Fisheries Management Agents visited both the Sam Su No. 301 and Sam Su No. 201. Vessels of the Samyang fleet were part of the war reparations received from Japan. None of the vessels had fresh water-making capabilities. As of June 25, 1968, the fleet's total catch was reported as 350 metric tons, consisting of nearly 100 percent walleye pollock. Average catch by the fleet per fishing day was about 30 metric tons.

The fish were salted in the round and placed in burlap bags, each bag containing about 50 pounds (25 kilograms) of pollock. Then, they were frozen and kept under refrigeration in the holds of the processing ship, or on the accompanying refrigerated transport.

The Trawlers

Trawlers of the Samyang fleet are Japanese built, 100 gross tons, about 90 feet long with a 5-foot draft, and can make 8 knots. Each trawler has 15 crew members. The vessels work as pair trawlers and their most efficient fishing depth was reported to be 40-50 fathoms.

Fig. 2 - The South Korean trawlers in Kodiak Harbor belong to the Samyang Fisheries Co. Built in Japan, the vessels are about 100 gross tons, 90 feet long, have a shoal draft of 5 feet, and speed of 8 knots. Each trawler is operated by 15 men.

A company official aboard the Sam Su No. 201 said that 1967 and 1968 could be considered not merely as test fisheries, but as exploratory fishing.

Second Company

Besides the Samyang fleet, a stern trawler, the 'Kang Wha No. 601,' of the Government owned Korean Marine Industry Development Corp., made at least 2 trips to the fishing grounds off Alaska in 1968. She was first seen in late June in the approaches to Bristol Bay north of Port Heiden on the Alaska Peninsula. The vessel remained in that area for a week and then fished along the Aleutian Islands. She was observed near Attu Island, the western tip of the Aleutians, in mid-July, and indicated she was headed home. In mid-December 1968, she was again reported off Alaska, near the eastern Aleutians, returning to fish the grounds north of the Alaska Peninsula.

Although the Kang Wha No. 601 was observed fishing on several occasions, there were no fish visible on deck, so the exact catch composition is unknown. It was reported that, in mid-July, a stern trawler identified as the 'Kang Hwa No. 602' ended a month-long exploratory fishing cruise in the eastern Bering Sea and returned to Pusan with about 400 tons of walleye pollock and some herring. Available information indicates this stern trawler was probably the Kang Wha No. 601 and that the Kang Hwa No. 602, which was to fish for shrimp in the eastern Bering Sea, never operated in the Alaskan area.

Future S. Korean Fishing

The future of South Korean fishing off Alaska is uncertain. It is unlikely that the 1968 expeditions by either Korean company was highly profitable. In November, however, a Japanese news article reported that the S. Korean Government planned to support expansion of trawl fisheries in the Bering Sea and North Pacific Ocean. The fishery resources on Alaska's vast Continental Shelf have already lured large fishing fleets from Japan and the USSR.

ARE ALL FISHES EDIBLE?

Not all fishes are edible. Some have organs that are always poisonous to man; others sometimes become toxic because of certain elements in their diet. In Japan, a national dish called fugu is highly prized. It is prepared from the puffer fish, and the gonads of the puffer are highly poisonous. For this reason, fugu is only served in restaurants licensed by the government.

Consumption of sharks and rays has been known to cause illness or death; this was probably because the victim ate a portion of the liver, which contains a very high concentration of vitamin A that the human body cannot tolerate.

There are 300 tropical species of fishes that cause fish poisoning; one type of poisoning is commonly known as ciguatera. A particular species may cause ciguatera when caught on one side of an island, but not if caught on the other side. These tropical fish are associated with reefs and do not usually venture far from the home reef; for this reason, the people living on one island may eat a certain species of fish, while those on a nearby island would not. No one knows what causes the fish to become poisonous, but most investigators agree that it is something in the diet. There is no method to determine before a fish is consumed whether or not it will cause ciguatera. Some common species of fish known to cause ciguatera are: surgeon fish, jacks, porgies, snappers, goatfish, moray eels, wrasses, and barracudas.

Scombrid fish, commonly known as tuna or mackerel, have been known to cause scombrid poisoning, usually because of inadequate preservation. The flesh of scombrid fish contains bacteria which, if the fish is not preserved soon after capture, begin to produce a histamine-like compound. This compound, if ingested by humans, causes a severe allergylike reaction and may even lead to death. ("Questions About The Ocean," U.S. Naval Oceanographic Office.)

ANCHOVETA (PERU)

"Dynamics of the Fishery for the Anchoveta, *Engraulis ringens*, off Peru," by Milner B. Schaefer, Boletin, Vol. 1, No. 5, Instituto del Mar del Peru, Callao, 1967, pp. 189-304, in English and Spanish.

It has been known for a long time that a very large quantity of anchoveta, along the coast of Peru and northern Chile, formed the principal food for a large guano bird population and for the larger predatory fishes. The utilization for fish meal of anchoveta caught by purse-seine vessels, known in Peru as 'bolicheras,' began in the early 1950s. The fishery grew from a modest 7,000 tons in 1951 to 9.8 million in 1967. Before and during the development of the fishery, there were fears that it would lead to disastrous consequences for both guano birds and anchoveta. This concern about the proper development and control of the resource had the fortunate consequence of providing one of the few instances when adequate statistical and biological data have been collected and analyzed during the early development of an important commercial fishery.

Data on catch, effort, size composition of the catches, and information on the biology and ecology of the anchoveta have been collected. This has made it possible to insure against both overexploitation and premature curtailment of exploitation.

Dr. Schaefer has examined the population structure and biology, measurement of the catch, fishing efforts, and apparent abundance of the anchoveta. Estimating the relation of catch, effort, and catch-unit-of-effort, he has concluded the average maximum sustainable yield to be 10 million tons, divided between guano birds and man.

BLUE CRAB

"Growth of Juvenile Blue Crabs, *Callinectes sapidus* Rathbun, in the St. John's River, Florida," by Marlin E. Tagatz, Fishery Bulletin, Vol. 67, No. 2, Fish & Wildlife Service, Dept. of the Interior, 1968, pp. 281-288, illus. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

Information on crab growth is needed to estimate the time required for any particular size to reach harvestable size. This is a report on studies of growth increments, molt intervals, and the effects of salinity and temperature on juvenile blue crabs in the St. John's River, Fla. Estimates in increase--and of width with age--indicate that most blue crabs in the river reach harvestable size (width of 120 mm.) within 1 year after hatching. Relative growth was studied by holding juveniles in anchored floats.

COMMUNIST CHINA

"Economic Aspects of the Fishing Industry in Mainland China," by Jan J. Solecki, Institute of Fisheries, Univ. of British Columbia, Vancouver, 1966, 172 pp.

The reported expansion of mainland China's fisheries to the point where she may be the second or third greatest producer in the world has naturally aroused a great deal of interest. Unfortunately, there are very few data documenting this phenomenal expansion. Mr. Solecki reviews the history of the freshwater and marine fisheries, summarizes the scattered literature available, and touches on the social and economic features affecting the resource. Most of the information has been derived from Chinese releases and may be biased to show how much fishery production has increased under communism.

DOLPHIN

"Distribution of Delphinidae (Cetacea) in Relation to Sea Surface Temperatures off Eastern and Southern New Zealand," by D.E. Gaskin, Publication No. 126, Fisheries Research Division, New Zealand. (Reprinted from 'N. Z. Jl. mar. Freshwat. Res.', pp. 527-34, Sept. 1968.)

Mr. Gaskin analyzes the records of 4 species of Delphinidea, in waters east and southeast of New Zealand in relation to surface temperatures. He suggests that distributions of dolphin species off the east coast of New Zealand are closely associated with certain temperature ranges and, consequently, with specific water masses and convergence regions.

HERRING

"Spawning, Distribution, Survival and Growth of Larval Herring (Clupea harengus L.) in Relation to Hydrographic Conditions in the Bay of Fundy," by Naresh Das, Technical Report No. 88, Fisheries Research Board of Canada, 1968, 156 pp., illus.

Herring, one of the most commercially abundant fish in the Bay of Fundy-Gulf of Maine area, is a source of great wealth to the Maritime Provinces and to Canada as a whole. Since changes in distribution and abundance affect the fisheries industry, a sound basis for prediction of seasonal variation of herring must be established. Prediction demands a knowledge of stock origins, its distribution and dispersal to the fishing grounds.

This report, ecological in approach, includes a general study of the spawning areas, seasonal production, distribution of larvae and young herring, survival, and growth, in the Bay of Fundy-Gulf of Maine area as far south as the northern edge of Georges Bank. Mr. Naresh Das also attempts to determine just how much hydrographic conditions influence the availability of herring.

INDUSTRY ANALYSIS

"Economic Analysis of the Commercial Fishery Industry of Georgia," by D. H. Carley, Research Bulletin 37, Georgia Game and Fish Commission, June 1968, 92 pp.

Even though the fishery industry in Georgia is not new, very little information has been published on its contribution to the State's economy. This study was undertaken to provide a basis for decision-making by the fishery industry, and by State and Federal agencies charged with administration of seafood resources. It includes analyses of investments, processing, sales, employment, and the major fisheries.

MACKEREL

"Synopsis of the Biological Data on the Pacific Mackerel, Scomber japonicus Houttuyn (Northeast Pacific)," by David Kramer, FAO Species Synopsis No. 40, Circular 302, Fish & Wildlife Service, Dept. of the Interior, 1969, 18 pp., illus. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

This synopsis is an attempt to bring together all existing knowledge on the identity (nomenclature, taxonomy, morphology), distribution, bionomics, life history, population, fishery, and protection and management of the Pacific mackerel.

MARKETING

"Analysis of Demand for Fish and Shellfish," by J. C. Purcell and Robert Raunikar, Research Bulletin 51, Georgia Game and Fish Commission, 1968, 37 pp.

This is a report based on quarterly household data gathered over 5 years. It investigates the nature and magnitude of the influence of quantifiable socio-economic variates on the demand for fish and shellfish.

NAVIGATION

"Celestial Navigation," by Frances W. Wright, Cornell Maritime Press, Cambridge, Md., 1969, 160 pp., illus., $7.50.

Celestial navigation using the sextant, an accurate timepiece, and the 'Nautical Almanac' is still an extremely important method of navigation. This book provides a quick, easy, and thorough explanation (with realistically worked examples) of the practice of celestial navigation at sea, using simple and inexpensive equipment. The only mathematical requisite is an ability to add and subtract without making a mistake.

OCEANOGRAPHY

"Oceans," by Karl K. Turekian, Prentice-Hall, Englewood Cliffs, N. J., 1968, 120 pp., illus.

This book is an introduction to the study of the oceans, emphasizing the geologic and chemical aspects. It draws on recent data on sounding of the ocean depths and geophysical explorations of the ocean bottoms, and relates them to the geologic history of the oceans and the continents.

Covering a vast range of subjects within the field of oceanography, Dr. Turekian discusses the structure and topography of the ocean floor, the nature and transport of sediments, aspects of the Earth's history during the Ice Age as recorded in ocean-bottom sediments, the circulation and other movements of ocean water, marine geochemistry, and the origin and history of ocean water and ocean basins.

OIL POLLUTION

"'Torrey Canyon' Pollution and Marine Life," edited by J. E. Smith, Marine Biological Association of the United Kingdom, Cambridge Univ. Press, 1968, 196 pp., illus.

After the release of 117,000 tons of crude oil from the tanker 'Torry Canyon,' liberal applications of oil solvent/oil emulsifier mixtures were used to disperse the oil at sea, and to clean the rocks and beaches along 140 miles of the Cornish coast. Based on a 10-week survey, this is a report on the detergents' effect on marine plants and animals.

The investigations provided much new information about the movement of oil at sea, properties of detergents, their dispersal in the sea, and about the pollutants' effects on animals and plants at sea and on the shore.

OYSTERS

"Maturation of Gonads of Oyster, Crassostrea virginica, of different Geographical Areas Subjected to Relatively Low Temperatures," by Victor L. Loosanoff, Reprint, 'The Veliger,' Calif. Malacozoological Soc., Berkley, Calif., Vol. 11, No. 3, Jan. 1969, pp. 153-163, illus.

Dr. Loosanoff describes the comparative progress of gametogensis of oysters of different geographical areas kept in Milford Harbor, Conn., for approximately 3 months, and then subjected to conditioning at relatively low temperatures.

PURSE SEINE

"Designing an Improved California Tuna Purse Seine," by M'nakhem Ben Yami and Roger E. Green, FIR preprint No. 66, 11. 183-207, illus., Oct. 1968. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

In the eastern tropical Pacific, about 50% of the purse seine sets for tuna are unsuccessful due mostly to fish escaping the net during setting and pursing operations. This report describes the design of a proposed purse seine that will largely retain the desirable features of the presently used seine, but will sink faster and use increased webbing with efficiency.

SALMON

"Photographic Atlas of Sockeye Salmon Scales," by Kenneth H. Mosher, Fishery Bulletin, Vol. 67, No. 2, pp. 243-280, 1968, illus., Fish and Wildlife Service, Dept. of the Interior. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

Sockeye salmon is the most valuable species of Pacific salmon in North America. Spending their early lives in fresh water, they migrate to the North Pacific, and finally return to their natal streams to spawn and die. Growth zones form on their scales, recording the growth of each fish. The fresh and salt water zones, differing in appearance, show the years the fish spent in each environment, the year it hatched, and the year it migrated to the sea.

The atlas shows in detail the features of sockeye scales so workers can learn how to interpret them. Photographic plates of the scales, with explanatory text, illustrate variations in scale features. Examples of regenerated, resorbed, and other atypical scales have been included.

SEABASS

"Management of the White Seabass (Cynoscion nobilis) in California Waters," by James C. Thomas, Fish Bulletin 142, California Dept. of Fish and Game, Sacramento, 1968, 34 pp., illus.

The white seabass ranges from Juneau, Alaska, to Magdalena Bay, Baja California. Sport and commercial fishermen esteem it for both prestige and monetary value. A general history of declining and erratic catches in the 1950s indicated that the resource was not stabilized, despite regulations designed to achieve a consistent and relatively high yield.

This is a report on the relative abundance, rate of growth, and age and size composition of the resource. It includes an estimate of survival and mortality rates, and evaluates current management practices in sport and commercial fisheries.

SEAWATER ANALYSIS

"A Practical Handbook of Seawater Analysis," by J.D.H. Strickland and T.R. Parsons, Bulletin 167, Fisheries Research Board of Canada, Ottawa, 1968, 311 pp., illus., C$7.50. Sold by Queen's Printer, Ottawa, Canada.

Intended to be an authoritative reference on seawater analysis, this book provides full working instruction for procedures, found reliable in the laboratory and at sea, that have a sensitivity and precision adequate for most marine ecology studies. In most cases, the methods can be mastered by relatively inexperienced workers.

Although a measurement of the photosynthetic potential of a sample of seawater, or of the growth rate of suspended matter, is not strictly seawater analysis, these determinations are becoming increasingly important in many marine laboratories. A short section on some basic procedures has been included.

TANNER CRAB

"A Few Studies on the Ripeness of Eggs of Zuwaigani, Chinoecetes opilio," by Katsuchiyo Ito, translation from 'Bull. Japan. Reg. Fish. Res. Lab.,' Vol. 11, pp. 65-76, 1963, and "Fisheries Biology of the Tanner Crab. II-On the Frequency of Molting," by Tohshi Kon, Masakazu Niwa and Fumio Yamakaea, translated from 'Bull. Japan. Soc. of Sci., Fish.' Vol. 34, No. 2, pp. 138-142, 1968.

Translation Series Nos. 1117 and 1129, respectively, Fisheries Research Board of Canada, Biological Station, St. Andrews, N.B., 1968.

TUNA

"Age and Growth of the Yellowfin Tuna (Thunnus albacares) in the Pointe-Noire and Dakar Regions (West Africa)," by J.C. Le Guen and C. Champagnat, Doc. No. 431 S.R., Office de la Recherche Scientifique et Technique Outre-Mer, Centre de Pointe-Noire, Oceanographic, 1968, 22 pp., translated by John P. Wise. Translation No. 19, Tropical Atlantic Biological Lab., BCF, Miami, Fla., 1969.

UNDERWATER ACOUSTICS

"Seasonal and Diurnal Occurrences of Fish Sounds in a Small Florida Bay," by Charles M. Breder Jr., Bulletin of the American Museum of Natural History, New York, 1968, Vol. 138, Art. 6, pp., 325-378, illus., $2.

With the development of simple and easily handled equipment, suitable for use by other than electronic specialists, studies involving underwater acoustical activity have advanced rapidly. Very little work on soni ecology and its relation to the life history and behavior of any species has been reported. The primary purpose of this study was to provide preliminary background data on acoustic activities of certain shore fishes.

WHALES

"Sperm Whales of the Southeast Pacific," by Robert Clarke, Anelio Aguayo L., and Obla Paliza, Hvalradets Skrifter, No. 51, Det Norske Videnskaps-Adademii Oslo, 1968, 80 pp., illus.

In a stock exploited by whaling, the size distribution of the catch is not apt to be of value as a racial characteristic, but external characters and dental formulae may give useful information on stock limits. This paper describes the Southeast Pacific sperm whale stock in terms of the variation of these characters, and attempts to compare this variation with published results from other stocks where appreciable numbers of whales have been examined.

WORLD FISHERIES

"Yearbook of Fishery Statistics--Catches and Landings, 1967," Vol. 24, Food and Agriculture Organization of the United Nations, $6. Sold by the National Agency for International Publications, 317 E. 34th St., New York, N.Y. 10016.

The Yearbook tables cover the catches or landings of all fish, crustaceans, molluscs and other aquatic animals, residues and plants, made by commercial and subsistence fishermen in freshwater and marine areas. Statistics are given by continents, countries, regions, fishing areas, and species.

--Barbara Lundy

INTERNATIONAL

Government Experts Report on Expanded Nordic Economic Cooperation

Fisheries will play an important role in any expanded Nordic economic cooperation in the future. Long-term discussions underway revolve around the question whether expanded Nordic cooperation is preferable to the possibility of joining the European Common Market. A summary of the proposal for increased cooperation made by Nordic government representatives follows.

The cornerstone in the plan is establishment of a Nordic customs union over a 5-year period. Then, the 4 countries would have a common external tariff system and free trade within the Nordic area. A preliminary review indicates that, in general, the proposed Common Nordic duties for fish products would represent increases over existing Danish duties.

Price Stabilization

The main fisheries proposal, introduced by Norway, calls for a system to stabilize first-hand prices for fish at Nordic landing ports. The 4 countries either would establish a market-regulating agency, or expand the existing marketing apparatus to make the market-regulating system work.

Each national regulating agency would have these objectives: (1) to set minimum prices on fish landed, (2) limit supplies of fish to the market for human consumption when necessary to maintain established minimum prices, (3) to regulate supplies with regard to each port's capacity to secure best possible utilization of landings, and (4) to regulate, and perhaps stop fishery when necessary to prevent market collapse. Operations of the national market-regulating agencies would be financed by a landing fee, collected by each agency, not over 3% of value.

Crisis Funds

If market conditions deteriorate and the national agencies prove inadequate, 2 common Nordic crisis funds might be used: One would be established for herring and mackerel market, the other for cod, haddock, coalfish, pollock, and plaice. Each fund would be administered by a special inter-Nordic coordinating agency; the latter would also consult with the national agencies to set minimum prices. Separate funds and coordinating agencies are required for these 2 catgeories of fish. This is because herring and mackerel are, to some extent, sold as food for humans--but mostly go into meal and oil production. The price system must accommodate these 2 uses.

The crisis funds would be established by annual appropriations from Nordic countries of about US$4.3 million, until the two-fund total was about US$21.4 million. If the marketing situation deteriorated beyond the control of the national agencies, money could be allocated from the crisis funds for price-support payments--or to buy and store surplus fish to regulate market. Provision would be made to replenish crisis funds.

The Norwegian proposal does not cover fully the method of setting minimum prices. It proposes merely that prices for fish in landing ports be set in relation to one another, according to differences in freight rates to the major markets for Nordic fish.

Herring & Mackerel

For herring and mackerel, coordinated minimum prices would be set to enable full exploitation of the human food market. Fish that could not be sold at or above minimum price would be withdrawn from market. These would be sold for animal feeding, or to produce meal and oil. Most of surplus would go for meal and oil; a Nordic-wide guaranteed price would be set.

The guaranteed price would be maintained by the national agencies through regulation or stoppage of the fishery. If these were inadequate, support payments could be made from crisis fund for these species.

5 Food Fish Involved

For the 5 food fish involved, coordinated minimum prices would also be set (as outlined above) when these 5 are sold fresh for

human consumption--or for freezing, canning, or salting. A minimum price for dried fish might be set in North Norway, the only Nordic area where it is produced in significant quantities. Whenever necessary to maintain minimum prices, food fish that could not be sold to people would be withdrawn from the market and sold for animal feeding or industrial use. The national agencies would regulate the fisheries.

When marketing difficulties were severe the food-fish crisis fund could be used to guarantee prices of fish purchased for storage to regulate market. It could also extend guarantees for production of certain quantities of processed fish, and possibly undertake to buy up stocks to assure continued production. If continuation of these measures were no longer justified, the national agencies would further curtail the fisheries.

Difficulties Expected

Implementation of price stabilization would make possible direct landings of fish in the 4 countries without discrimination. It is proposed further that funds would be made available for structural improvements. The plan assumes various restrictions on fishery trade would be removed when the customs union begins, although considerable difficulties are anticipated in the liberalization process.

The report also urges further cooperation in: (1) exports to third countries, including desirability of Nordic-wide minimum export prices for certain fish products, (2) commercial policy, especially with regard to a common Nordic stand on European Communities actions, (3) aid to developing countries, and (4) marine research, product development, and marketing. (U.S. Embassy, Copenhagen, Jan. 31, 1969.)

Prospects for European Industrial Fisheries

The 1969 Norwegian winter herring catch was predicted to be about 370,000 metric tons, assuming normal weather conditions. Herring arrived off Norway in mid-Feb. Bad weather held last year's catch to only 26,000 tons; 370,000 to 560,000 tons had been predicted. Catches of this stock fluctuate greatly from year to year. Weak year-classes in 1965, 1966, and 1967 were expected to hold catches down in 1968-70.

Summer Herring

The Icelandic summer herring fishery takes place after winter herring finish spawning and leave the Norwegian coast. Although the 1968 summer season was not successful, a more normal catch is expected this year.

Capelin

The capelin fishery off North Norway is subject to wide fluctuations--the 1968 catch exceeded 450,000 tons--but scientists will say only that there is hope for a reasonably good fishery in 1969.

North Sea Herring

Earlier, it was predicted that total North Sea herring catches by all countries would stabilize at 650,000 to 700,000 tons annually. With careful management the catch could possibly increase somewhat. However, reduced abundance of the aging 1963 year-class and lesser strength year-classes since 1963 indicate this stock will decline. Norway's share in 1969 is expected to be about 300,000 tons.

Mackerel

A large quantity of young mackerel entered the North Sea mackerel fishery in 1967. At the same time, the harvest of older mackerel had begun to diminish. Because it is uncertain whether this stock is overfished, results of the 1969 season will be watched with interest. Biologists state for management purposes that the catch should not exceed 450,000 tons; it was 868,000 tons in 1967 and 770,000 tons in 1968. (U.S. Embassy, Copenhagen, Feb. 11, 1969.)

1968 World Fish Meal Production Was 6% Over 1967

Total fish meal production in International Association of Fish Meal Manufacturers (IAFMM) countries increased 6% in 1968 to 3.8 million metric tons. Substantial production increases were reported in Canada, Chile, Denmark, U.K., Peru, and S. & S.W. Africa. W. Germany, Norway, and Iceland

lowered output in 1968, especially Iceland, where production dropped 53% from 1967.

	1/1968	1/1967
	. . . . (Metric Tons)	
Belgium	4,560	3,780
Canada	122,498	89,434
Chile	187,243	130,866
Denmark	222,770	149,261
France	13,200	13,200
West Germany	69,697	77,065
Sweden	8,029	7,824
United Kingdom	88,717	80,487
United States	190,725	167,154
Angola	3/ 37,457	44,763
Iceland	53,242	112,849
Norway	401,932	491,562
Peru	1,922,020	1,815,983
So. Africa (including S.-W. Africa)	471,142	351,928
Spain	53,000	43,600
Morocco	2/	35,000
Total	3,846,232	3,614,756

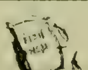
1/Revised.
2/Data not available.
3/Jan.-Oct. only.
Note: Japan does not report fish meal production to IAFMM on a monthly basis at present. Estimate for 1968 of fish meal and other animal meal (mostly fish meal), is 440,000 metric tons; 387,000 metric tons in 1967. (Foreign Agricultural Service, Tokyo, Oct. 1968.)
Source: IAFMM.

FEO Fish Meal Exports Rose 20% in 1968

In 1968, over 3.1 million metric tons of fish meal were exported by members of the Fishmeal Exporters Organization (FEO), almost 20% more than in 1967. An increase of 500,000 tons from Peru and about 70,000 from S. and S.W. Africa more than made up for Iceland's tremendous decline. Entering 1969, stocks were lower for every FEO country except Chile. In 1968, FEO countries produced 82% of total world fish meal production (excluding Japan and USSR).

Country	1968	1967
	. . . . (Metric Tons)	
Angola	1/	37,810
Chile	167,191	111,199
Iceland	60,632	135,008
Norway	432,048	487,516
Peru	2,083,205	1,560,900
S. and S.W. Africa	353,407	285,951
Total	3,096,483	2,618,384

1/Data not available; 35,500 tons through Oct. 1968.
Source: Fishmeal Exporters Organization.



Marine Oil Production

World marine-oil production in 1969 is expected to increase slightly from 1968. This estimate reflects anticipation of further expansion in fish oil output and a possible increase in baleen whale oil. Sperm whale oil production probably will remain around 1968's volume.

It is difficult to predict world production of fish body and liver oils because of these developments: (1) recent reports of reduced oil yields in Peruvian anchovies, together with a 4-week "Veda," or stoppage, that began Feb. 1, and a reduced catch; (2) probable improvement from the poor 1968 herring-oil output in Norway and Iceland; (3) sharp increases in 1968 output in Chile, Denmark, and S. & S.W. Africa, possibly continuing at a lesser rate; and (4) large stocks in some producing countries and relatively low prices may tend to discourage fishing.

Estimated World Marine Oil Production

	1969	1968	1960-64
	. . . (1,000 Short Tons) . . .		
Marine Oils:			
Whale	105	100	356
Sperm whale	150	150	137
Fish (including liver)	1,150	1,125	687
Total	1,405	1,375	1,180

Scandinavia Important Factor

Assuming that Peru's output declined by 15%, and that no significant increases come from other countries, then any significant change in output must rest on likelihood and extent of a recovery in output from Norway and Iceland. Since a 10% improvement from their estimated combined 1968 output could more than offset the expected decline in Peru, any recovery beyond that would increase world output. Such an improvement is expected. And, with possible increases by minor producers, would result in some increase, possibly 2-3% above last year. In case the estimated increase does not materialize, stocks are sufficiently large to cover near-term requirements.

Whale Oil

Breaking the downtrend that has persisted since 1961, production of baleen whale oil this year is expected to increase by about 5% from 1968's estimated low of 100,000 short tons. Any increase will be largely contingent on

fulfilling the Antarctic quota of 3,200 blue-whale units (BWU) at an average outturn of 21 tons per BWU. This year's Antarctic quota remained unchanged from the year before, when the catch was only 2,801 BWU. This yielded an average of 21.1 tons per BWU. Partly offsetting the expected increase in Antarctic production, pelagic output from the North Pacific may decline somewhat due to the International Whaling Commission's decision to reduce the catch of fin whales. Japan, the Soviet Union, and Norway now provide about 90% of the world output, largely from Antarctic catch.

Sperm whale oil production which is subject to the Antarctic quota agreement is not expected to differ significantly this year from 1968. However, it is expected to be 10% above the 1960-64 average. Soviet output has sharply expanded in recent years; it is now over three-fifths of the world total. Numerous small producers have either cut back or ceased operations. Most expansion in recent years has been in North Pacific pelagic catch, while output from shore stations outside the Antarctic has continued to decrease. Production from other major areas, including Antarctic pelagic output, remains at about 1960-64 average. ("World Agricultural Production and Trade," Jan. 1969.)

Thermal Pollution Endangers Fish

Trout, salmon, and other fresh-water fish are increasingly threatened by hot effluents from industrial plants. Danger of "thermal pollution" is greatest in rivers and streams where electric and other power plants discharge water heated to between 43°-61° F. This often is deadly to fish, their eggs, and the organisms on which they feed. Thermonuclear plants generate very high temperatures, making them a particular threat.

Dangers of Heat Change

Fish, as cold-blooded creatures, are extremely sensitive to heat changes, particularly to sudden changes. During spawning, a temperature increase of only 2 to 3 degrees can be fatal. Increased temperatures also can be indirectly harmful, weakening the resistance of fish to disease, reducing the essential oxygen in the water, or augmenting toxic effects of organic pollutants.

EIFAC Recommendations

The problem has been cited by the European Inland Fisheries Advisory Commission (EIFAC) of the Food and Agriculture Organization. EIFAC seeks to promote inland fisheries in Europe. The 21-nation Commission is drafting international water-quality criteria to combat pollution affecting freshwater fish.

Benefits from Heated Water

EIFAC points out, however, that with certain species, such as carp, controlled hot effluents can be beneficial. They may provide warmth for better spawning and feeding conditions and aid in maturation of eggs. Roach, a coarse fish now popular with European anglers, actually thrives in U.K. streams where hot effluents remain tolerable.

Carp Bred in Heated Water

In Poland, where common carp usually do not propagate in natural waters, the report states, the species has reproduced successfully in artificially heated Lake Lichen. Carp's tendency to congregate in heated effluent outfalls has led to Soviet attempts to breed them in floating cages in heated water reservoirs.

Thermal Pollution Endangers Salmon

In North America, thermal pollution is considered a severe challenge to the great salmon runs of the Columbia River. A study of the biological effects of thermal pollution there is under way. The trout and salmon resources of northern streams in other countries may be similarly endangered. The work of EIFAC supplements that in the U.S., where the latest report on water-quality criteria, by the National Technical Advisory Committee, emphasizes preserving fish stocks from increased heat loads. (FAO News.)

Japan & Canada Conduct Joint Whaling Venture

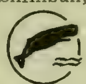
The Atlantic Whaling Co., Saint George's, Nfld., was formed in July 1967 by Taiyo Fishing Co., Japan, and Fishery Product, Ltd., Canada. It has been performing successfully.

The company is capitalized at US$100,000; Taiyo holds 49.5% interest. It catches and processes fin whales, and operates one chartered whaling vessel, 'Fumi Maru No. 15' (499 gross tons), out of the shore plant at Williamsport.

Catch & Production

In 1967, Fumi Maru caught 262 fin whales, exceeding an assigned quota of 250; in 1968, it fulfilled the reduced quota of 219.

The whales are processed at the shore plant. The plant can process 4 whales and freeze 35 tons of meat a day. The whale meat, exported primarily to Great Britain, also goes to other European countries, including West Germany and the Netherlands. A limited quantity is marketed locally. Export price for frozen whale meat is around $253 a ton. ("Suisan Keizai Shimbun," Jan. 30, 1969.)



Japan & USSR Hold Crab-Fishing Conference

A Japanese-Soviet crab conference began in Moscow on Feb. 6. The USSR called the conference to discuss Japanese crab fishing in connection with the Soviet Continental Shelf declaration announced Feb. 1968.

Again, as in the 1968 Japan-USSR fishery negotiation in Moscow, the Soviets may attempt to ban Japanese crab fishing in the Northwest Pacific, on the basis of the Continental Shelf concept.

The Japanese delegation was led by Iwao Fujita, Vice-President, Japan Fishery Society. Minister of Fisheries Alexander Ishkov headed the Soviet delegation. ("Suisancho Nippo," Jan. 30, 1969.)

Fear Depletion of North Sea Fishery Resources

Two-hundred scientists from 14 countries have warned that if drastic antipollution measures are not taken soon, the entire North Sea flora and fauna will be threatened. They fear that North Sea fishery resources will be destroyed in the near future, according to the official organ of the Soviet Ministry of Fisheries. The report also stated that the scientists have appealed to governments and international organizations to intensify research aimed at solving the problem of ocean pollution--especially North Sea.

North Sea

The report pointed to the highly developed industries and high population density of the North Sea coastal nations. Their rivers discharge huge amounts of wastes into the sea and into the extremely shallow coastal waters, where insignificant tidal phenomena prevent self-purification of the waters. ("Rybnoe Khoziaistvo," Nov. 1968.)

Without specifically mentioning pollution, the Minister of Agriculture and Fisheries of The Netherlands has said that the North Sea virtually could be written off as a fishing ground. He noted that over the past 3 years herring catches have dropped 50%. The Netherlands Ministry is considering financial assistance for fishing enterprises forced to look for new grounds outside the North Sea because of this situation. (U.S. Embassy, The Hague, Jan. 31, 1969.)

FOREIGN

CANADA

PLANS FISHERMEN'S SCHOOL

A first-of-its-kind training school for fresh-water fishermen is being built at Hnausa, Manitoba, west shore Lake Winnipeg. Already it is attracting considerable interest from the fishing industry across Canada.

The school is based on research findings indicating commercial fishing in Manitoba is changing rapidly; also, that it will change further when the proposed fish-marketing board paves the way for orderly marketing, more stabilized prices, better quality control, and more efficient operation.

A comprehensive training program was needed because existing skills and knowledge in the fresh-water industry are below standards necessary to attain maximum benefits from a change in marketing. When the new school opens this year, training will be tied in with real situations, using practical methods, on the site of fresh-water fishing.

Fish-Demonstration Station

The school is a fish-demonstration station to cover all phases of production--from actual setting and lifting of nets through final product. Classroom and practical instruction courses will be aimed at imparting management skills and techniques necessary to operate a station. The students will be fishermen with some knowledge and perhaps limited experience of fishing. They will be exposed to new types of fishing gear and advanced fishing methods in classroom and in the water.

The first class of 25 has been enrolled for a course beginning in March 1969, when the school and its facilities are scheduled to be completed. The school has adequate area to expand. ('Fisheries of Canada,' Jan. 1969.)

* * *

CONFERENCE ON QUEEN CRAB SCHEDULED

A 2-day conference on the queen crab fishery was held March 4-5 in Fredericton, N.B., Canada. Minister of Fisheries Jack Davis and New Brunswick Premier Louis J. Robichaud were guest speakers.

The conference was sponsored by the Federal Department of Fisheries in cooperation with the Maritime Provinces, Quebec, and Newfoundland. It brought together specialists and industry personnel for discussions about the development and management of the new fishery. Papers were presented on catching, processing, and marketing.

Fishery Booms

The phenomenal growth of the queen crab fishery on the Atlantic Coast was a highlight of Canada's fisheries in 1968. In the past 4 years, the catch has grown from nothing to 10 million pounds in 1968. Landings are expected to double in 1969.

The queen crab fishery has provided a new source of revenue to many fishermen and plant workers. It is a valuable export commodity. (Canadian Department of Fisheries, Jan. 27, 1969.)

* * *

QUEBEC DOES NOT RENEW FISHING SUBSIDIES

The Province of Quebec has not reinstated the ordinary fishing subsidies it dropped in fall 1968, when Federal fishing subsidies began, even though the government abandoned its fishing-subsidy program in the meantime. A Quebec official hopes that something can be worked out between Canada and the U.S. to alleviate the plight of Quebec fishermen. He adds, however, that no subsidy plans were under consideration at Quebec. (U.S. Consul, Quebec, Feb. 20, 1969.)

* * *

'GREENLAND TURBOT' PROMOTION BEGINS

The Dept. of Fisheries and the Dept. of Trade and Commerce plan to exhibit 'Greenland turbot' at the Pacific Fine Foods Fair in Los Angeles, June 1969. This is a move to promote acceptance as 'Greenland turbot' of the fish previously marketed as 'Greenland halibut.' Late last year the U.S. banned sales of this fish as halibut. (U.S. Consul, St. John's, Feb. 14, 1969.)

EUROPE

Norway

LANDINGS DECLINED IN 1968

In 1968, Norwegian fishermen landed 2.6 million metric tons of fish--15% less than in 1967. Chief cause of the decline was a 42% drop in the herring catch and an 11% drop in mackerel landings. Fortunately, 1968 was a good year for capelin, which are used for fish meal. This averted a totally disastrous year. ('Fiskets Gang,' Dec. 1968, No. 52.)

	1/1968		2/1967		1966		1965	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	1,000 Metric Tons	Million Kr.	1,000 Metric Tons	Million Kr.	1,000 Metric Tons	Million Kr.	1,000 Metric Tons	Million Kr.
Mackerel.	770	177	868	202	484	183	158	74
Herring	702	166	1,215	286	1,186	404	1,079	355
Capelin	522	50	403	49	380	68	217	31
Cod	238	303	200	260	197	262	188	242
Saithe	79	51	128	81	143	96	131	85
Norway pout	66	8	14	2	25	6	61	11
Haddock	48	55	40	45	63	72	50	60
Dogfish.	20	14	16	13	16	14	19	14
Greenland turbot . .	19	18	15	14	14	14	15	14
Cusk	17	18	17	20	15	17	20	22
Other.	91	162	113	212	131	200	141	199
Total	2,572	1,022	3,029	1,184	2,654	1,336	2,079	1,107

1/Preliminary.
2/Revised
Note: 7.135 Kr.=US$1.

* * *

STOCKFISH MARKETING PROSPECTS ARE GOOD

Commercial sales of Norwegian stockfish have shrunk drastically since spring 1967, and nothing indicates early improvement in marketing prospects. Some North Norwegian communities depend almost entirely on stockfish production, so concern has been voiced repeatedly by the press, Parliament, government, and fishery organizations.

Small Sales, Large Inventories

The reduced sales are due almost exclusively to the drop in demand from Nigeria, the number one market for so-called "African quality" stockfish. Commercial deliveries, mostly to the Province of Biafra, decreased from more than 17,000 metric tons--70% of all Norwegian stockfish exports--before the civil war, to only a few hundred tons in 1968. Sales of prime quality stockfish were also somewhat sluggish during 1968, presumably because buyers abroad anticipated price reductions due to increasing Norwegian inventories. Despite substantial state purchases, stockfish inventories in mid-Feb. 1968 were about 12,000 tons (excluding 6,700 tons of state-purchased fish distributed to relief agencies), or one-half of a normal year's production. Judging by officially projected production for 1969 and current marketing prospects for both prime and "African" quality stockfish, inventories could increase to about 18,000 tons during 1969 unless some is purchased by government and/or relief agencies.

Government Assistance

To maintain a minimum production of stockfish, the Norwegian Government has effected measures, including interest-free loans and state guarantees to producers and exporters. These measures claimed nearly US$28 million in state funds in 1968 alone, including $9.5 million for state purchases of about 14,000 tons of "African quality" stockfish. The rationale for them is to support North Norwegian fishing communities heavily dependent on stockfish production and to ensure output of prime quality stockfish, which commands high prices in such European markets as Italy, Sweden, and Finland.

Year	Production	Exports	Year-End Stocks
	. . . .	(Metric Tons)	. . . .
1968	21,600	16,700	19,000
1967	23,000	18,900	16,500
1966	25,200	26,000	14,000

Norway (Contd.):

Commercial exports were less than 10,000 tons in 1968 since 7,000 tons of the total were state-purchased fish distributed abroad through the World Food Program, the Red Cross, and the Norwegian Church's Relief Organization.

Prospects

Norway will produce an estimated 15,000 to 16,000 tons of stockfish in 1969. Nigeria cannot be expected to resume stockfish purchases in the foreseeable future, and development of new markets in Africa cannot be anticipated in the short term. Therefore it is reasonable to assume that commercial exports of Norwegian stockfish in 1969 will remain at the 1968 level of about 10,000 tons. This means that stockfish inventories will swell to about 18,000 tons at the end of the year if no measures are taken to dispose of surplus production. No such plans have been announced by the government, but state guarantees have been extended for a maximum of about 9,000 tons of the 1969 "African quality" stockfish production. (U.S. Embassy, Oslo, Feb. 21, 1969.)

* * *

MIXED REACTION TO U.K. TARIFF ON FROZEN FISH

Findus, one of Norway's major fillet exporters, reports adverse effects on its frozen fillets exports to the U.K. since Britain imposed a 10% import duty late last year. Frionor, another firm, claims it is too early to predict ultimate effects of new duty on its 1969 exports to Britain.

Before the 1967 pound devaluation Britain was Findus' largest market, taking some 34% of its total exports. After devaluation, fillet block exports dropped about 40%, while Findus' volume of consumer-packed fish continued at the same level even at considerably reduced prices. Before the 10% was introduced, Findus had succeeded in restoring sales to the pre-devaluation level. Under the new duty, Findus' customers can cover their requirements from other suppliers, mostly British, at prices with which Norway is unable to compete. Exports may be reduced even further if the 10% duty is maintained.

To Hold U.K. Market

Frionor says it has supplied only quality products at high prices. It believes Britain, a traditional market, will continue to require Norwegian fish. The Norwegian fishing industry will not withdraw, but will take necessary measures to retain this important market.

Although British fishermen may benefit competitively to some extent from the new duty, it may be that British demand for Norwegian products will be such that adjustments to increase prices will be made. However, Icelandic products will become more competitive in the British market. Iceland has not been a member of EFTA, and so has not benefited in the past from the reduced duty under EFTA arrangements. (U.S. Embassy, Copenhagen, Feb. 20, 1969.)

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BARENTS SEA HAS FISH CONSERVATION PROBLEM

Rapidly diminishing resources of fish, particularly cod and related species, in the Northeast Atlantic is one big unsolved problem, says Hallstein Rasmussen, Deputy Director, Norwegian Fisheries Directorate. Fishermen seem unable to see beyond the present ample supplies of fish although there are some marketing problems abroad, notably for stockfish. Scientific predictions of drastic catch reductions in the immediate future seem to make no impression on fishermen, who scooped up large quantities of fish just outside the coasts of Troms and Finnmark during most of 1968. This apparent paradox of good fishing and small fish resources is explained by the fact that capelin, a major food for Barents Sea cod and related species, stayed just off the coasts of Troms and Finnmark for unusually long periods in 1968. Catches of capelin for reduction reached an all-time record in 1968--over 0.5 million metric ton.

Fish Scarce in Barents Sea

In the Barents Sea proper, outside the Norwegian fishery border, fishing was very poor. The few trawlers, mostly Russian, kept as close as possible to Norwegian waters to catch fish. If and when capelin leaves Norwegian waters (as it often does), there will not be much other fish left either.

Norway (Contd.):

Resource Management Needed

Conservation and replenishment of Northeast Atlantic fish resources depend on much more comprehensive measures than those considered so far. One plan would have nations fishing in the Barents Sea reduce their catch from the current 400,000 metric tons annually to 250,000 tons. Even the latter figure is too high in the opinion of many Norwegian marine biologists. The best solution, Rasmussen says, would be a complete ban on trawling, at least in areas known as feeding grounds for fish before they reach maturity. There should be no reason to ban longlines and handlines because they are much more selective than trawls. (U.S. Embassy, Oslo, Jan. 24, 1969.)

* * *

NORWAY FORBIDS DANISH TROUT-EGG IMPORTS

Norway and Sweden have forbidden the import of trout eggs from Denmark to prevent introduction of virus diseases, presumably infectious pancreatic necrosis (IPN). IPN appeared on some Danish trout farms during 1968.

Effects of Ban in Norway

A Norwegian sports fishermen's association at Lillehammer was forced to cancel an order for 300,000 Danish eggs. Other clubs and some trout farms will also be affected. Substantially increased trout egg output in Norway is planned to relieve the shortage. (U.S. Embassy, Copenhagen, Feb. 14, 1969.)

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EXPLORATORY FISHING IN GULF OF MAINE

The Norwegian Institute for Marine Research has chartered the distant-water longliner 'Pero' for a 2-month exploratory cruise between Cape Race, Newfoundland, and Cape Cod. The investigations were recommended following failure of the cod fisheries off West Greenland last year. Funds totaling US$68,000 are available for the work.

New Fishing Grounds

Pero sailed from Norway on Jan. 25, 1969, with a skipper who has fished porbeagle on these grounds. They are largely unknown to Norwegian cod fishermen, who have not fished at such great distances from their home ports before. Later, the exploratory fishing will be extended to grounds off West Greenland. (U.S. Embassy, Copenhagen, Feb. 14, 1969.)

Denmark

GREENLAND'S 1968 SALMON CATCH IS WELL BELOW 1967's

The 1968 catch of salmon in Greenland waters will probably total about 1,200 metric tons, or about 25 percent below the near-record 1967 catch of 1,588 tons. The 1968 inshore catch was less than half 1967's. It is presumed the presence of colder water was responsible. The catch of the offshore fishery more than doubled. This resulted from the larger number of vessels fishing and the excellent weather through most of the season.

Price Higher

The price paid for Greenland salmon was higher at the beginning of the 1968 season than in the previous year. It increased as the season progressed. Because fishing was lucrative this year, offshore fishing effort can be expected to continue increasing.

The joint tagging program of the International Council for the Exploration of the Sea and the International Commission for the Northwest Atlantic Fisheries was continued--but few fish were tagged. Northumberland T-nets were tested again, with little success. This may have been due to ice and hydrologic conditions obstructing fish from coming inshore. The low availability of fish in these waters is also indicated by poor results of inshore fishing by Greenlanders. (U.S. Embassy, Copenhagen, Feb. 4, 1969.)

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Denmark (Contd.):

FAROESE FISHERMEN'S STRIKE SETTLED

A strike by Faroese fishermen was called off Feb. 19, 1969, when they accepted a compromise proposed by a government mediator. The fishermen had wanted an increase in minimum monthly wage to US$267 and a reduction from 27 to 21 in long-line vessel crews. This would have increased each crew member's share of the catch. The full demands of the fishermen were not met, but the Faroese legislature has appropriated nearly US$1 million for minimum wage increases and for additional price support.

Last Strike in 1954

The strike was the first in the Faroe Islands since 1954. It began in early Dec. 1968 when the fishermen's association refused to approve the sailing of vessels to the main Faroese fishing grounds off Greenland and Newfoundland. The strike, formally declared at the end of Jan. 1969, included most of the Faroese fishing fleet. (U.S. Embassy, Copenhagen, Feb. 20, 1969.)

* * *

SMALL HADDOCK POSE PROBLEM

Industrial fishermen from the North Sea port of Esbjerg found an abundance of small haddock when fishing resumed after the new year. Fifty percent or more of most catches were haddock smaller than the minimum size limit of 270 millimeters (10.6 inches). The Danish Fisheries Inspection Service, acting immediately, fined 50 to 60 Esbjerg skippers amounts up to US$800. It was thought that industrial fishing in Esbjerg might have to cease entirely for a time. In late January 1968, incidence of illegal haddock in the landings had declined. Some cutters had located places where "pure" catches of herring could be taken.

Fishermen Ask Relaxation of Regulations

Fishermen's association representatives met with the Ministry of Fisheries to ask a relaxation of regulations. After the meeting the Minister of Fisheries said that no basic change could be made because the regulations had been set in cooperation with other members of the North East Atlantic Fisheries Commission. He promised, however, that skippers would be treated as gently as possible under the circumstances.

Potential Market for Haddock

Although cod are highly esteemed as food for people, there is very little demand for haddock. Haddock were popular before 1930, but "went out of style" as a food fish after a period of scarcity; the market has never come back. Many haddock now abundant in the North Sea will exceed the minimum size in a few months, so there will be a possibility of landing them as food fish. Although fish exporters would buy more haddock in auctions, fishermen consider them more difficult to clean on board than cod and plaice, and may not believe the extra work worthwhile.

Landings in Previous Years

Total Danish haddock landings in 1967 were 24,000 metric tons; only 6,400 tons were used for food fish, the remainder for industrial use. Total 1966 landings were 47,000 tons; 8,000 tons were sold for human consumption. Haddock exports were 4,800 tons in 1967 and 4,700 tons in 1966; most was shipped fresh to West Germany, Sweden, and the U.K. (U.S. Embassy, Copenhagen, Jan. 21, 1969.)

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FISH MEAL, OIL, AND SOLUBLES PRODUCTION, 1967-68

	1968	1967
	. . (Metric Tons) . .	
Fish Meal.	219,079	145,359
Fish Oil.	70,198	61,197
Fish Solubles . . .	25,892	30,865

(U.S. Embassy, Copenhagen, Feb. 26, 1969; Denmark's Statistical Dept. 1967 totals.)

Sweden

THE SHRIMP TRADE

Sweden's West Coast Fishermen's Association recently asked the government to restrict shrimp imports, but in late Jan. the government decided not to act. Swedish fishermen landed 1,251 metric tons of cooked

Sweden (Contd.):

shrimp in 1968, compared with 1,154 metric tons in 1967. In addition, a small quantity of raw shrimp has been delivered to canneries each year. Imports of shrimp in 1968 are estimated at more than 2,000 metric tons.

Swedish Shrimp vs. Imported

Almost all imported frozen shrimp sold in Sweden has been described as "Canadian shrimp." In Goteborg, some stores sell only Swedish shrimp, and some sell both Swedish, Canadian, and Norwegian shrimp. One retailer, refusing to sell frozen Canadian shrimp, has appealed to his colleagues to follow his example. "Support Swedish fishermen--buy Swedish shrimp" is the text on a streamer in the store window. Imported shrimp prices are from 20% to 30% lower than domestic. Swedish shrimp is generally considered to be higher quality than imported shrimp.

U.S. Exports

The U.S. has developed a lucrative shrimp trade with Sweden. In 1968, the U.S. exported 487,181 lbs. of fresh, chilled, unpackaged shrimp valued at $474,147; 415,269 lbs. of fresh, chilled, packaged shrimp valued at $303,079; and 817,068 lbs. of frozen shrimp worth $540,849. (U.S. Consul, Goteberg, Feb. 6, 1969.)

United Kingdom

WHITE FISH AUTHORITY
RAISES INTEREST RATES

The British White Fish Authority has announced new interest rates on loans made from Dec. 21, 1968.

On loans for fishing vessels, new engines, nets and gear:

Less than 5 years, $8\frac{3}{8}$%--up $\frac{1}{8}$%.

More than 5, but less than 10 years, $8\frac{1}{2}$%--up $\frac{1}{4}$%.

More than 10, but less than 15 years, $8\frac{1}{2}$%--up $\frac{1}{4}$%.

More than 15, but less than 20 years, $8\frac{5}{8}$%--up $\frac{1}{8}$%.

On loans for processing plants:

Less than 5 years, 9%--up $\frac{3}{8}$%.

More than 5, but not more than 20 years, 9%--up $\frac{1}{4}$%.

Rates on loans made before Dec. 21, 1968, are unchanged. ("Fish Trades Gazette," Jan. 11, 1969.)

West Germany

A REVIEW OF
WEST GERMAN OCEANOGRAPHY

From 1962-1968, the German Research Association (DFG) provided almost US$1.25 million annually to supplement government funds for oceanographic research. This support was greatly responsible for progress German scientists have made trying to catch up to France and Britain--and to regain position of eminence once held by German oceanographers.

The support of DFG, the Federal Government, and 4 coastal states resulted in considerable expansion of oceanographic efforts. During the 5-year period beginning in 1962, the number of scientists and technicians increased from 253 to 527. A fishery research vessel, 'Walter Herwig' (1963), research vessel 'Meteor' (1964), Bundeswehr research vessel 'Planet' (1967), and research cutters 'Alkor' and 'Friedrich Heinicke' were launched to supplement the work of the 2 then-existing ocean-going research vessels, 'Gauss' and 'Anton Dohrn.'

Growth Plans

Germany's annual marine research budget is now only about one-third the French and British budgets. Despite this, Science Minister Stoltenberg included marine research as a special area of his ministry and established the German Commission for Oceanography.

The Science Ministry will further consolidate earlier DFG-supported work through long-term planning and financing. Present plans call for 54 more scientists, about 100

West Germany (Contd.):

more technicians, and construction of an 800-GRT research vessel and 3 research cutters. The research vessel would be used in the Baltic and North Seas and North Atlantic. The two cutters would replace older vessels.

European Pooling of Effort

Programs are also under consideration to build artificial islands and place measuring buoys in the North Sea and Baltic Sea. Construction of a major laboratory, with wave-simulation tanks and rotation pools for hydrodynamic experiments, faces financial problems.

DFG realizes that requirements for oceanographic instruments would not be great enough to encourage national industries in Europe to conduct research and development necessary to develop technology. DFG recommends a pooling of effort by European industries to develop and manufacture complex oceanographic measuring equipment. (U.S. Embassy, Bonn, Jan. 28, 1969.)

Netherlands

FISHERIES MINISTER NOTES
DECLINE OF NORTH SEA FISHING

The North Sea can virtually be written off as an important fishing ground, said Netherlands' Minister of Agriculture and Fisheries, P.J. Lardinois, in discussing his 1969 budget on Jan. 29, 1969. In the last three years, the Minister noted, herring catches had been halved.

He is now considering what financial assistance might be given to sound fishing enterprises forced to look for new fishing grounds outside the North Sea. (U.S. Embassy, Hague, Jan. 31, 1969.)

Iceland

DECLINE IN HERRING
DRASTICALLY REDUCES 1968 CATCH

Iceland's 1968 fishing catch dropped to 554,000 metric tons, a 40% decline from 1967 and 55% from 1966, according to preliminary data. Most of the loss is attributable to the drastic decline in herring catches. These dropped from 895,600 tons in 1966 to 207,000 tons in 1968. (U.S. Embassy, Reykjavik, Jan. 16, 1969.)

USSR

COUNCIL OF MINISTERS PRODS
MINISTRY OF FISHERIES

The Soviet Council of Ministers has adopted a resolution titled "Additional measures to improve the efficiency of the fishing fleet and improve the quality and expand the selection of fishery products." The resolution notes that implementation of earlier council decisions to develop the fishing industry has strengthened its technical and supply capacity, increased the fish catches, and improved the quality and variety of fishery products somewhat.

Failures of Ministry of Fisheries Cited

At the same time, because of weak leadership by the Ministry of Fisheries, the powerful fishing fleet is not being used efficiently. Marketed products do not meet the consumer's demand for variety and quality. Steps to remove these shortcomings are not being taken. Output of edible fishery products lags considerably behind the increase in catch. This has a negative effect on the economics of fishery enterprises. Consumer demand for live and frozen fish, filleted fish, fresh-salted herring, and cured, smoked, and delicatessen products is not being fully satisfied. There is not sufficient volume in output of fishery products in packages with colorfully designed wrappings.

Government Recommendations

The government has requested the Ministry of Fisheries to raise the efficiency of the fishing fleet. To achieve this, it is essential

USSR (Contd.):

to provide the fleet with an explored and studied report of available fish stocks in the world ocean. The Ministry must develop and introduce, during 1969-1970, cost effective vessel-deployment schedules for every area of marine fishing.

New types of vessels will be built and the fleet will be equipped with modern fishing gear and technological plants. Facilities to repair the fishing vessels' technical equipment will be developed and training of qualified workers for ship repair trades will be expanded.

To satisfy the demand for high quality and great variety in fishery products, the Ministry was instructed to increase the catch of valuable species during 1969-1970, expand production of filleted fish and frozen semiproducts (not fully manufactured) on fishing vessels, and to develop commercial processing of smoked, pickled, dried, cured, and delicatessen fish products where they are consumed. By 1970, the Ministry also must assure an output of lightly and medium salted salmon products. ("Izvestiia," Jan. 28, 1969.)

* * *

POLICIES OF FISHERY MINISTRY ATTACKED

Two recent articles in a Soviet literary weekly attacked the Ministry of Fisheries and Minister A.A. Ishkov personally. The main charges were: (a) neglect of traditional inland fisheries; (b) excessive emphasis on marine fisheries, without due regard for fresh-water fisheries; (c) inadequate antipollution measures; (d) systematic overfishing in the Sea of Azov.

Marine vs. Inland

The articles reported that from 1913 to 1967 total Soviet fisheries catch increased 600% but inland catch increased only 25%. The latter is a decline if one considers Soviet population growth. Marine fishing is uneconomic and wasteful: cost of one metric ton for marine fish is 810 rubles (US$900), and for fresh-water fish 750 rubles (US$830), excluding transportation and storage costs. These are much less, if not negligible, for fresh-water fish since most of the catch is marketed on the spot.

The Fisheries Ministry's promotion policy is criticized as inadequate for encouraging the consumer to buy products from marine fish alien to Russian cuisine.

Water Pollution

Criticism was directed at the inadequate fight against water pollution. Ishkov's Ministry was accused of inefficiency since "no one there does anything about it." The Ministry's fish breeding, transplantation, and acclimatization practices were also attacked. The critic charged that it makes no sense to transplant fish to polluted water, where the resource has been destroyed and nothing is being done to clean the water.

The director of the Azov-Black Sea Research Institute for Fisheries and Oceanography is quoted as saying that nature, not man, is in control of reproduction and recruitment. We are far from influencing the qualitative and quantitative composition of fishery stocks through artificial fish-breeding operations.

Overfishing in Azov Sea

Overfishing in the Sea of Azov is said to have reached alarming proportions. Ishkov was criticized for evading the problem of the fishery kolkhozes (cooperatives) in the area. Where there are too many fishermen and too few fish, the result is widespread poaching and theft. Substantial quantities of fish, stolen from the kolkhozes, are sold at twice the regular price. Moreover, the Fisheries Ministry was accused of giving out inaccurate Azov Sea catch statistics. Actually, they are twice as high because of poaching.

Marine Fisheries Favored

The Fisheries Ministry also was criticized for pushing expansion of marine fisheries without too much concern about stock depletion, growing number of coastal states claiming ownership of Continental Shelf and extending their jurisdiction to 100 and even 200 miles offshore, and for not having "one single specialist on inland water bodies" on its staff. ("Literaturnaia Gazeta," No. 39, Sept. 25; No. 50, Dec. 11, 1968.)

[Comment: The author of the articles, Eligii Stavskii, may be incorrect about the inland catch data. According to official Fisheries Ministry statistics, inland catch for

USSR (Contd.):

1967 was about 810,000 metric tons. If the 1913 inland catch was 843,000 tons, this is a decrease of some 4%, not an increase of 25%.]

* * *

CATAMARAN TRAWLER TESTED SUCCESSFULLY IN NORTH ATLANTIC

A twin-hulled research trawler displacing 1,000 metric tons was successfully tested for a month in the Barents Sea. It is the first trawler of its kind in the world. The Kaliningrad-built vessel already had undergone navigation tests in the Baltic.

The Baltic tests proved the vessel easier to maneuver and more stable than conventional trawlers. The test cruise in the Barents Sea, during heavy winter storms, was intended to show whether the vessel could operate under toughest weather conditions. The test was fully successful.

Seaworthy

Scientific data on the vessel's navigational qualities showed that water pressure against the bridge connecting the hulls never exceeded 1.5 atmospheres, even during the heaviest seas. This section can withstand pressures up to 5.5 atmospheres. At wind force 10 on the Beaufort scale (wind speed between 55 and 63 miles an hour), she listed an average of 3 to 5 degrees, with a maximum list of 12 degrees. The deck remained dry, and the crew could work leisurely. On a conventional trawler, men could not have worked on deck for fear of being washed overboard.

* * *

OCEAN PERCH CLEANING MACHINE IN PRODUCTION

In 1967, the Vladivostok Machine Plant of the Far-Eastern Fisheries Administration manufactured the first machine for cleaning ocean perch. The gutting and cutting of ocean perch, a time- and labor-consuming operation, usually is performed manually in Soviet fisheries.

The semi-automatic production line, designed to process up to 180 fish per minute, virtually eliminates manual labor.

Tested Successfully

The machine was tested successfully aboard a freezer stern trawler of the Maritime Fisheries Administration, probably off Alaska. It is now ready for serial production. Four more semiautomatic ocean perch cleaning machines are nearing completion at the Vladivostok plant. ("Rybnoe Khoziaistvo," No. 9, 1968.)

* * *

CONFERENCE ON FISH BEHAVIOR

In late Feb. 1968, a conference on fish behavior, as related to fishing techniques and tactics, was held in Murmansk. It was organized by the Ministry of Fisheries to coordinate research on fish behavior, bring together scientists working on similar subjects in different institutes, and to formulate recommendations for future research.

PINRO Director A. P. Alekseev once said that "Soviet scientists are not behind foreign fish behavior scientists in a number of subjects. In certain subjects, for example in the formulation of theoretical principles and in the processing of collected test data, Soviet scientists are ahead of foreign scientists."

Subjects of Research

At Murmansk, 36 papers were presented on (1) fish behavior under natural conditions; (2) fish behavior in the area of fishing gear; (3) reactions of fish to an electric field, and to light, sound, and chemical stimuli; and (4) underwater research techniques.

The papers will be published by the Ministry of Fisheries. Some papers dealt with hydrostat "Sever-1" and research on distribution and behavior of cod and haddock at 500 meters just off bottom; hydroacoustic surveys determining behavior and distribution of Pacific hake and ocean perch; use of hydroacoustics in locating tuna concentrations; reaction of squid to light; and fish reaction to air curtain. Several scientists described the use of an underwater stereophoto camera. Authors and titles of papers are described in detail in the No. 6 issue of 'Voprosy Ikhtiologii' (1968), page 1117.

USSR (Contd.):

Recommendations

Soviet fishery scientists stressed the need to study Continental Slope fish stocks down to 1,500-2,000 meters as essential. This is because fishing on Continental Shelf already is fully developed--and availability of Shelf resources to Soviet fleets has decreased in recent years.

The following major research subjects were recommended for study: fish behavior under natural conditions, reaction to physical and chemical stimuli, experimental research on nervous system activities in fish, characteristics of vertical migration of fishes, and schooling behavior.

* * *

WHITE STURGEON AND STERLET CROSSBRED

An extraordinary cargo--fry of a new hybrid produced by crossing the white sturgeon and the sterlet--was airlifted a few months ago to Moscow from Rostov. Having inherited excellent taste qualities and the outer appearance of its parents, the hybrid has some new properties of great importance: it is more capable of growing and developing, and can be bred in ponds, while sterlet and white sturgeon live only in running waters.

The Rostov fry have acclimatized well in the ponds of the Moscow Region and grow in weight as fast as carps. (Novosti Press Agency.)

* * *

RESEARCH VESSEL CRUISES IN EQUATORIAL ATLANTIC

In early February 1969, the Soviet oceanographic vessel 'Akademik Kurchatov' left Kaliningrad on a 3-month cruise in the equatorial Atlantic. The scientists aboard will study ocean currents off Brazil, the Guianas, and in the Antilles. The vessel is expected to make port calls at Rio de Janeiro, Georgetown (British Guyana), and some islands in the Caribbean.

The expedition is headed by Dr. Vladimir Kort, the former Director of the Institute of Oceanology of the USSR Academy of Sciences. ("Vodnyi Transport," Feb. 4, 1969.)

* * *

RESEARCH CRUISE IN SOUTHWEST PACIFIC

A main purpose of the cruise of the Soviet research vessel 'Vitiaz' is to determine the viability of large-scale fish farming to increase the marine catches. M.E. Vinogradov, Deputy Director of the USSR Science Academy Oceanology Institute and head of the expedition, reported on the first 2 months in the southwest Pacific.

What Scientists Did

At scientific stations in the Gilbert Islands, New Caledonia, and the New Hebrides, the vessel's scientists used radioisotopes to determine certain aspects of the microfauna and microflora, tested the amount of nucleonic acid in fish to establish their growth rates; studied the vertical distribution of animals in the ocean using bathyphotometers to record the luminescence of sea organisms; measured the formation rates of microflora forming mineral salts and the rates at which the salts are consumed by fish and other marine animals. Other studies dealt with the role of bacteria in the formation and development of marine food chains.

French Advice

During a call at Noumea, French New Caledonia, in early Jan., the Soviet scientists met with French biologists studying the South Pacific. The French advised the Soviets on selecting an appropriate research area in the Coral Sea. Vitiaz resupplied in Brisbane, Australia, before continuing research in the equatorial Pacific. ("Izvestiia," Jan. 31, 1969.)

The Soviet scientists were invited by Australians to visit the Great Barrier Reef research station on Heron Island, where they visited laboratories and conducted research on luminescence of corals and other animals.

The cruise is completed, and M. E. Vinogradov summarized its results in official Izvestiia as follows. The expedition collected a unique complex of quantitative data on the biological productivity of the ocean. The

USSR (Contd.):

growth rate of animals feeding on microscopic algae was determined for the first time. Previously, bacterial cells were not considered food because of their size, and to explain their role in plankton the scientists measured the amount of energy transferred from one food level to another. It was shown that bacteria form special agglomerations of great importance as a food component for small marine animals. Intensive plankton research with special nets, bathyphotometers, and radioisotopes determined the intensity of photosynthesis, and yielded for the first time a detailed picture of the vertical distribution of plankton. Large, stable accumulations of animals, microorganisms and detritus were discovered at depths of several dozen meters. These strata perform extremely important functions in the life of the ocean's upper layers.

The material collected by the expedition will be used to design a mathematical model of the vital links between marine animals, and to compile a generalized "biological productivity map" of the ocean. ('Izvestiia,' Feb. 20, 1969.) On her way to Vladivostok, the Vitiaz called at Nagasaki, where the Soviet scientists met with their Japanese colleagues.

CARIBBEAN

Haiti

SPINY LOBSTER EXPORTERS ORGANIZE TO FORCE DOWN EXVESSEL PRICE

Three of Haiti's 6 spiny lobster exporters agreed in Jan. 1969 to pay only markedly reduced prices for spiny lobster tails--65 US cents a pound to independent fishermen, and 80 cents a pound to "speculateurs," middlemen who buy from native fishermen. Previous price as as much as US$1 a pound to fishermen, $1.10 to "speculateurs." Success of effort is not expected to result in lower spiny lobster tail prices for U.S. importers. (U.S. Embassy, Port-Au-Prince, Feb. 7.)

IS SEAWEED A WEED? WHAT IS IT AND HOW DOES IT GROW?

Plants as useful as seaweed can hardly be considered weeds because weeds are commonly defined as uncultivated (wild) plants that are useless, unsightly, and have no economic value. Seaweed is used as a food by millions of people, particularly along the Pacific Coast of Asia; it also serves as food for livestock.

Seaweed has many other uses, for example, as fertilizer, medicines, source of iodine, and ingredients used in preparation of bread, candy, canned meat, ice cream, jellies, and emulsions.

In the late 18th century seaweed was the primary source of soda until other sources became more economical and practical. In these years, thousands of tons of soda were derived from sea plants.

Attached seaweeds grow only along the narrow border near shore. Growth is depth limited because natural sunlight is needed for the photosynthesis processes of the plants. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

LATIN AMERICA

Brazil

SHRIMP EXPORTS TO U.S. RISE SHARPLY

U.S. imports of Brazilian shrimp in 1968 increased sharply over previous years. The trend is expected to continue. U.S. imports through November 1968 were almost 7 times the 1967 total. From 1960 through 1964, annual U.S. imports ranged from 7,500 to 57,450 pounds. In 1966, shrimp imports from Brazil were 473,223 pounds. Efforts by new interests forecast increases in production from Brazil's largely untapped shrimp resources.

U.S. Imports 1/ of Brazilian Shrimp

Month	1968	1967	1966
	. . . . (1,000 Pounds)		
Jan.	22	23	11
Feb.	11	6	-
Mar.	-	4	102
Apr.	-	22	92
May	236	7	26
June	12	-	95
July	197	6	19
Aug.	193	2	78
Sept.	17	-	36
Oct.	198	-	24
Nov.	300	57	3
Dec.	n/a	49	-
Total	1,186	176	486

1/U.S. Import Statistics, U.S. Bureau of the Census.

U.S. Interests

Two firms were established at the mouth of the Amazon in Belem by U.S. interests. Together, these firms plan to export more than 4 million pounds of shrimp annually to the U.S. This would be almost 3.5 times as much as all Brazilian shrimp exports to the U.S. in 1968. Shipments will begin some time in 1969.

In the state of Sao Paulo, one large firm and several smaller firms already are exporting frozen shrimp to the U.S. The large firm reportedly exported more than 500,000 pounds during second-half 1968.

Shrimp-processing firms in Sao Paulo and elsewhere are interested in marketing their product in the U.S. and want to contact U.S. buyers and investors. (U.S. Consulate, Sao Paulo, Dec. 31, 1968.)

Mexico

PILOT FISHING PORT COMPLEX SUCCESSFUL

Mexico's pilot fishing complex at Alvarado, Veracruz, on the Gulf of Mexico, operated successfully during 1968. Overall production was up from 1967 and, according to the director, would have been higher had 15 trawlers on order been delivered on time. (U.S. Embassy, Mexico, Feb. 19.)

Fish and Fishery Product Production

Species	1968	1967
	. . . . (Metric Tons) . . .	
Mackerel	1,161.5	1,075.1
Clams	912.7	1,511.3
Snook	464.6	-
Shrimp (headless)	299.6	268.9
Red snapper	83.4	-
Shrimp (heads-on)	47.3	29.9
Crab, cleaned	20.4	-
Squid	14.2	-
Sharkskin, salted	12.4	-
Shark fins	2.6	-
Total	3,018.7	

. . . .	Number
Boats operating	18
Boats under construction	15
Employees	287
	Tons
Fish canned . . . . worth $2,000,000 pesos (US$160,000).	182.5

Unloading frozen ("headed") bigeye tuna from a Taiwanese longliner at Abidjan, Ivory Coast. The vessel fished in the tropical Atlantic. The tunas weigh about 150 lbs. (Photo: Peter Wilson, TABL, BCF.)

ASIA

Japan

1968 CANNED TUNA IN BRINE EXPORTS TO U.S.

Japan exported 3,090,816 cases (48 7-oz. cans) of canned tuna in brine to the U.S. in 1968. This was 97% of the quantity which could be imported into the U.S. under the lower tariff of 11% ad valorem. The 1968 U.S. import quota for brine-packed tuna was 3,189,764 cases; any imports in excess of that would have been dutiable at 22% ad valorem.

Imports from other countries are estimated to have been around 400,000 cases, for a total of close to 3.5 million cases, about 300,000 cases over the quota. The cut-off point for imports under the lower tariff rate was reached in mid-December: thereafter, about 500,000 cases were placed in U.S.-bonded warehouses. ('Kanzume Nippo,' Feb. 18, 1969.)

* * *

FACTORYSHIPS LEAD BOTTOMFISH FISHERY IN E. BERING SEA

Two trawl fleets, led by the factoryships 'Chichibu Maru,' 7,472 gross tons (GT) owned by Nichiro Fishing Co., and 'Kashima Maru,' 7,163 GT (Nihon Suisan), are operating in the Bering Sea bottomfish fishery.

The factoryship 'Soyo Maru,' 11,192 GT (Taiyo), fishing there until Jan. 18, returned home on Jan. 26. After undergoing hull extension, she is scheduled to depart for the Bering Sea on Apr. 10, and return home again in late November.

Other Fleets Assigned

Other factoryship fleets assigned to the Bering Sea fishery this year and scheduled departure and return dates are: 'Hoyo Maru,' 14,094 GT (Hoko Suisan), mid-Apr., late October; 'Gyokuei Maru,' 10,357 GT (Nihon Suisan), Feb. 23, Oct. 4; 'Shikishima Maru,' 10,144 GT (Nihon Suisan), Feb. 27, Oct. 7; 'Nisshin Maru No. 2,' 27,035 GT (Taiyo), Feb. 1, late October; 'Seifu Maru,' 8,269 GT (Kokusai Gyogyo), departure date unknown. ('Suisan Tsushin,' Jan. 29, 1969.)

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BERING SEA BOTTOMFISH CATCH ROSE IN 1968

Bottomfish catch by 12 factoryship fleets in the Bering Sea reached 819,000 metric tons in 1968 (see table). Alaska pollock, the principal species used in producing minced meat aboard factoryships, predominated with 686,000 tons, or about 84% of total fleet catch, reflecting the effort made in minced meat production. ("Nihon Suisan Shimbun," Feb. 24, 1969.)

Bering Sea Bottomfish Catch

Species	1968	1967
	. . . . (Metric Tons)	
Alaska pollock	686,000	566,000
Flatfish	42,000	76,000
Pacific cod	37,000	32,000
Herring	17,000	31,000
Turbot	16,000	23,000
Rockfish	9,000	31,000
Shrimp	8,000	3,000
Sablefish	2,000	7,000
Other	2,000	2,000
Total	819,000	771,000

* * *

TUNA FLEET SIZE CHANGES LITTLE

By the end of 1968, 1,161 Japanese vessels, excluding those used seasonally, were licensed for the distant-water tuna fishery, the Japanese Fisheries Agency reports. Fleet size has not changed much during the past 5-6 years.

Vessel Sizes and Management Units, 1963-68

Size Range	1968	1967	1963
Gross Ton	. . . . (No. of Vessels)		
Under 100	240	318	457
100-180	279	260	150
180-240	246	229	193
240-300	137	131	132
Over 400	64	72	76
Total	1,161	1,165	1,152
Seasonally employed vessels	122	125	184

A downtrend in management units was marked by a decrease in number of enterprises owned by individuals, and an increase in corporation ownership. For example, in 1968 individual ownership totaled 257 units, and corporation ownership 363 units, compared with 530 and 184 units in 1963. ('Katsuo-maguro Tsushin,' Jan. 30, 1969.)

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Japan (Contd.):

TUNA LONG LINERS BUILT

Three new types of tuna long liners for the distant-water tuna fishery have been developed and built in the past two years. Each has a slightly different characteristic, but all have been designed to provide greater maneuverability and safety in adverse weather, and to reduce manpower requirements through mechanization. Equipped with modern navigational instruments--radar, loran, direction finder, fish finder, and facsimile communication equipment--the new vessels are the most efficient Japanese tuna long liners presently in operation.

"Pioneer" Type

The first, a Pioneer-type long liner, was built in Oct. 1967 by Kanasashi Shipbuilding Co. The vessel, between 299 and 345 gross tons, employs line haulers and other labor-saving devices. These reduced manpower to 18 crewmen. A newly developed freezing system improves the keeping quality of fish sufficently to bring an additional $378 a ton or more on the Japanese fresh-fish market. Over 20 new long liners of this type have been built already and are fishing southern bluefin off Australia.

Kanasashi's newest vessel of this type is 'Chiyo Maru No. 18,' completed Jan. 22, 1969. Principal specifications: overall length 171.9 feet, draft 11.8 feet, maximum speed 13 knots, cruising speed 11 knots, freezing capacity 16 tons a day, complement 20.

Double-Decked Long Liner

The second new type is a double-decked long liner built by Narasaki Shipyards. The bridge of this vessel has been located in the afterdeck to improve stability and provide greater fish-carrying capacity. Two recently built vessels of this type are now fishing southern bluefin off Australia. One is the 284-ton 'Zuiho Maru No. 11,' completed in Nov. 1968. Principal specifications: length 142.7 feet, beam 27.6 feet, draft 11.6 feet, maximum speed 13.4 knots, cruising speed 12.1 knots, freezing capacity 50 tons a day.

"All-Weather" Long Liner

The third is an "All Weather" (AW) long liner built by Niigata Steelworks. The AW vessels, with a bulbous bow to increase cruising speed, were designed to operate under rough weather conditions in the high latitudes off southern Australia. Seven vessels in this series are scheduled for construction in 1969. Two are already in operation. The 255-ton 'Fuji Maru No. 68,' completed Jan. 31, 1969, has a length of 133.2 feet, beam of 25.9 feet, draft of 11.5 feet, and a cruising speed of 10.5 knots with a maximum 13.34 knots. She is equipped with a trolley-type semi-air blast freezing system.

The second 255-ton AW long liner, 'Yakushi Maru No. 38,' recently departed on her maiden voyage to the eastern Pacific to fish tuna off Mexico. ("Suisan Keizai Shimbun," Feb. 28 & Mar. 4, 1969.)

* * *

TUNA FISHERMEN HAMPERED BY SHORTAGE OF BAIT SAURY

Part-time tuna fishery operators in Shiogama, getting ready early in March to put in one more tuna trip before shifting to salmon, found it virtually impossible to obtain bait saury. Shiogama is a large fishing port in northeastern Japan.

Scarcity of saury, caused by poor fishing in 1968, had sent prices soaring. The fishermen were unable to buy bait saury even at the exvessel price of about US$454 a short ton. Normally, prices for bait saury are around $176-202 a short ton. By end of 1968, prices had risen to a high of $378. ("Suisan Keizai Shimbun," Mar. 4, 1969.)

* * *

SHRIMP FISHERY IS ACTIVE OFF SOUTH AMERICA

About 50 independent Japanese shrimp trawlers, and a mothership fleet of 22 vessels, are shrimp fishing off the Guianas, northeast South America. Some independent trawlers are making money. But others, especially those that entered the fishery in 1968, are still operating at a loss. This is due to their unfamiliarity with the grounds, and lack of crew experience with U.S.-built double-rigged trawlers.

Nichiro Lost Money

Because of those factors, and labor-management problems, the mothership fleet

Japan (Contd.):

(owned by Nichiro Fishing Co.) lost about US$972,000 in 1968. Catches are averaging close to 500 pounds, heads off, per day, compared with around 350 pounds when the vessels first started fishing. ('Suisan Tsushin,' Jan. 22, 1969.)

* * *

TRADERS SEEK COMPENSATION FROM PHILIPPINE FIRMS

Nine Japanese trading firms are seeking compensation from 2 Philippine buyers for nonperformance of purchase contracts involving 316,500 cases (1-lb. tall 48's) of canned mackerel packed in Hokkaido, Japan.

In Aug. 1968, the Philippine firms contracted for 450,000 cases of canned mackerel, but failed to set up letters of credit for 316,500 cases scheduled for shipment by the end of Jan. 1969. The Japanese are demanding penalty payments of $40,005 from one firm and $14,070 from the other, for 3 months' interest charge and storage costs. ('Suisan Tsushin,' Feb. 26, 1969.)

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SHRIMP IMPORTS DROPPED IN 1968

Frozen shrimp imports in 1968--35,204 metric tons valued at about US$78.1 million--were down 21% in volume and 2% in value from 1967. It was the first decline since 1961.

Purchases from the Soviet Union slumped to 1,418 tons from 9,836 in 1967. Japan imports small red shrimp from the USSR and markets them peeled and cooked.

The 5 leading shrimp suppliers in 1968 were Mexico, 5,769 tons worth US$14,577,158; Thailand, 4,581; Communist China, 3,769; Hong Kong, 3,628; and India, 3,164.

Jan. 1969 Imports

Jan. 1969 frozen shrimp imports--2,884 metric tons worth about US$7 million--were down 723 tons from Dec. 1968, and about 500 tons from Jan. 1968. Communist China with 664 tons, worth US$1,027,800, was leading supplier. Other major suppliers were Mexico, 530 tons; Thailand, 353 tons; Pakistan, 266; Hong Kong, 230; Indonesia, 161; India, 132; and South Korea, 53. ('Suisan Tsushin,' Feb. 5 and 25, 1969.)

日本

South Korea

SETS PLANS FOR 1969 FISHING IN BERING SEA

South Korea planned to send one 9,400-gross-ton mothership and about 20 trawlers to the Bering Sea on April 1, 1969, according to Japanese industry sources. The operation was to be sponsored jointly by the Korea Marine Industry Development Corp., Samyang Fishing Co., and Shin Hung Refrigeration Co. A South Korean fishery official was reported saying that this year's expedition is a commercial extension of experimental operations conducted in the past two years.

He also said that the South Korean Fisheries Office is arranging a low-interest loan totaling around 400 million won (about US$1.4 million) to help vessel owners pay pre-departure expenses. An official of the South Korean Embassy in Tokyo stated on Jan. 31 that the fleet will not fish salmon. ('Nihon Suisan Shimbun,' Jan. 31, and 'Shin Suisan Shimbun Sokuho,' Feb. 1, 1969.)

The semi-Government Korea Marine Industry Development Corp. has been conducting exploratory fishing in the northeast Pacific with 1 stern trawler since 1967. The catch was mostly Alaska pollock. The operation reportedly is paying off through sales on domestic markets. The 1967 and 1968 operations of the Samyang Fishing Co. were poorly organized and probably a financial failure. The Shin Hung Co. recently was active in exploratory fishing for shrimp off Indonesia. Reportedly, results were below expectations. Merger of operations of the 3 companies probably indicates the 2 private companies will rely more during 1969 on available government expertise and able management introduced into the Korea Marine Industry Development Corp. by its present general manager, Mr. Oh, former director of ROK's Office of Fisheries.

* * *

FISH CARRIER LAUNCHED IN JAPAN

A 1,000-ton refrigerated carrier, ordered by the South Korean Koyo Distant Water Fishing Company, was launched in early November 1968 in Shizuoka Prefecture, Japan. The firm, largest in South Korea tuna fishing,

South Korea (Contd.):

owns 21 tuna vessels--ten 300-ton, ten 200-ton, and one 190-ton craft. They operate in the Indian and Atlantic Oceans.

In 1969, the firm plans to add two 500-ton fishing vessels as well as the 1,000-ton refrigerated carrier, to its tuna fleet. ('Suisancho Nippo,' Nov. 6, 1968.)

Taiwan

1968 FISHERY CATCH INCREASED 15.9%

Taiwan's fishery catch in 1968 was 531,045 metric tons, 15.9 percent more than in 1967.

Type of Fishery	1968	1967
	.... (Metric Tons)	
Deep-sea fisheries	241,458	189,097
Outer coastal fisheries	208,139	186,543
Inner coastal fisheries	24,861	26,316
Fish culture	56,587	56,181
Total	531,045	458,137

Deep-Sea Catch Rose Most

The deep-sea fishery catch was up 27.7% from 1967. This was the largest increase of any Taiwanese fishery. It was due principally to increased catches of tuna vessels added to the fleet in 1967 and 1968. Included are 80,475 tons caught by foreign-based Taiwanese vessels fishing in the Indian Ocean and in the Atlantic. The 1968 landings of the overseas-based Taiwanese fleet were up 109.4 percent from 1967's 38,396 tons.

Outer Coastal Catch Also Increased

The outer coastal catch was up 11.6 percent from 1967. This resulted principally from increased sardine and mackerel landings (up 19 and 120%, respectively) and higher shrimp catches (up 30%). (T.P. Chen, Chief, Fisheries Division, Joint Commission on Rural Reconstruction, Taipei, Republic of China.)

Ceylon

FISHERY DEVELOPMENT PROGRAM

Ceylon is developing her fishing industry to increase the domestic fish supply and to expand the industry's economic base. Many coastal inhabitants depend on fishing for their livelihood. The government has been working to develop the industry through the Department of Fisheries and the Ceylon Fisheries Development Corporation. Cooperative societies also may play a large part.

Industry Objectives

The functions assigned to the Ceylon Fisheries Corp. paint a good picture of industry objectives. The corporation will undertake (1) Fishing operations including deep-sea trawling; (2) Fish processing, canning, curing, drying and by-products; (3) Wholesale or retail marketing and distribution; (4) Construction and maintenance of fishery harbors and shore installations, including cold rooms; (5) Import and export of fish and fish products; (6) Import and sale of gear, tackle, and other necessary products. (7) Assist the Fisheries Department or any other department; (8) Construct boats and other craft for the fishing industry; (9) Repair and maintain facilities for fishing boats.

Current and Planned Projects

Fleet development is of prime importance. The present fleet is composed of small, nonmotorized craft and must return to port each day. The government is increasing the number of small mechanized craft. Harbor development is necessary. Mutwal is the only harbor, and it is too small. Most landing points are merely along beaches, and this will continue for many years despite planned harbor construction. The government has started a pilot plant to can sardines and mackerel; a tuna cannery in North Ceylon is expected to open this year. The distribution system will be improved. Marketing terminals already exist at Colombo, the main distribution center, Kandy, and Kurunegala. The socio-economic aspects of such a large development program have not been overlooked. ('Mainichi,' Feb. 4, 1969.)

SOUTH PACIFIC

Australia

CALL CRAYFISH ROCK LOBSTER, GROUP PROPOSES

The Rock Lobster and Prawning Assoc. of Australia wants to change the name of crayfish to rock lobster (spiny lobster in U.S.). The Association decided to change crayfish to rock lobster because of French proposals, put forward in the Codex standard, to use the name crawfish. If this were done, the Association felt, the price of Australian craytails sold in the U.S. would drop.

Uniform Names

The standard names of southern crayfish (*Jasus lalandei*) and western crayfish (*Panulirus cygnus*) were adopted in 1962 by the Commonwealth-States Fisheries Conference. A comprehensive list of uniform names for most commercial fish species was prepared at that same time. These names have been used in official publications.

The main reason for compiling a list was to achieve uniformity in statistical data. Any change in uniform name must be approved by the Standing Committee on Fisheries.

Common Names

Although crayfish is the name most fishermen use for southern and western crayfish, research workers call it spiny or rock lobster. It is marketed overseas as rock lobster (spiny lobster in U.S.).

Overseas, crayfish normally means freshwater crustaceans; lobster is usually the name for marine crustaceans with crab-like claws. There are no true lobsters in Australian waters. ('Australian Fisheries,' Jan. 1969; formerly 'Australian Fisheries Newsletter.' Name was changed Jan. 1969.)

AFRICA

Ghana

RELEASES SOVIET TRAWLERS

On Mar. 1, Ghana released 2 Soviet trawlers and their crews held since Oct. 10, 1968. A public statement on Mar. 3 announced that the 2 captains and 1 crew member will remain in Accra to assist a Commission investigating the activities of Air Marshal Otu. Allegedly he had attempted a coup d'état to bring back exiled former President Kwame Nkrumah. The Soviet trawlers were suspected of participating in the alleged plot.

Ghanaian Statement

The statement blamed "obstructive tactics" of the Soviet captains and crews for prolonging investigation of their intrusion into Ghana's territorial waters. The statement noted that Ghana's security was "not compromised" by release of the Soviet trawlers and crews; also, investigations by Ghanaian security services were not influenced by diplomatic pressures, and the decision to release the Soviets was taken "entirely" on the Government's initiative.

The statement added that Ghana desires friendly relations with the Soviet Union, but the powerful USSR must base her relations with Ghana on principles of equality, mutual respect, territorial integrity, and non-interference in internal affairs.

Language Barrier

In the Otu hearings, the investigative Commission apparently ran into language problems. On Mar. 4, the 2 Soviet skippers could not testify because no suitable interpreter was available. The hearing, therefore, was postponed until Mar. 7. (U.S. Embassy, Accra, Mar. 4, 1969.)

Fines

The 2 captains were fined about US$200 each for illegally sailing in Ghana's territorial waters. The trawlers left Takoradi for the USSR on March 4.

FOOD FISH FACTS

The Dungeness crab is found along the Pacific coast from Alaska to southern California. It is named after a small fishing village, on the Strait of Juan de Fuca in Washington, where commercial fishing for this crab began.

Dungeness Crab
(Cancer magister)

DESCRIPTION

The Dungeness crab is light reddish-brown on the back with a pattern of lighter streaks and spots. In some specimens, the anterior portion of the back is purplish. The underside varies from whitish to light orange, and the inner and upper sides of the anterior legs are colored crimson or purple. The large, hard-shelled crab measures up to 10 inches across the back and may weigh from $1\frac{3}{4}$ to $3\frac{1}{2}$ pounds.

HABITAT

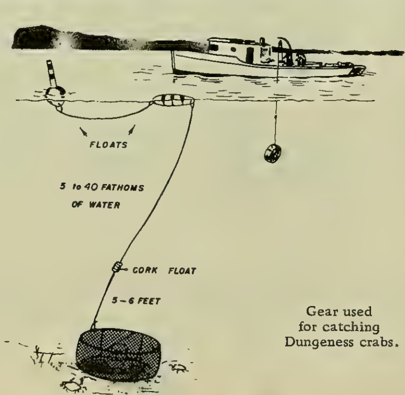
Although the Dungeness crab is found along thousands of miles of coastal areas, it is only known to inhabit sandy and grassy bottoms below the tidal range.

HISTORY OF FISHERY

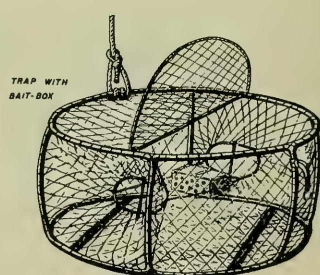
The Dungeness crab fishery is the oldest known shellfishery of the North Pacific Coast. Many years before the arrival of the white man, natives along the Strait of Juan de Fuca trapped crabs in crude homemade pots. The settlers were quick to realize the value of the Dungeness crab and began fishing for them.

CRAB FISHING

Fishing for Dungeness crabs is principally in offshore waters from 12 to 120 feet, with only incidental catches from estuaries. Occasionally crabs may be caught in depths up to 240 feet. Dungeness crabs are caught by pots and ring nets, using fresh or frozen bait such as razor clams, squid, or fresh fish. During the fishing season, fishermen move their pots according to the movements of the crabs; one week, crabs may be found in depths of 12 feet; the following week, they may be found in depths of 90 to 120 feet.



Gear used
for catching
Dungeness crabs.



(Continued following page.)

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INDEX (CONTINUED)

WHY IS THE OCEAN BLUE?

Not all sea water is blue. Water of the Gulf Stream, off the eastern coast of the United States, is a deep blue, but water of a similar current off Japan is so dark that it has been named Kuroshio (Black Stream). In other areas water may be various shades of green, brown, or brownish-red.

The sea is blue for the same reason that the sky is blue. The blue of the sea is caused by scattering of sunlight by tiny particles suspended in the water. Blue light, being of short wave length, is scattered more effectively than light of longer wave lengths.

Although waters of the open ocean are commonly some shade of blue, especially in tropical or subtropical regions, green water is commonly seen near coasts. This is caused by yellow pigments being mixed with blue water. Microscopic floating plants (phytoplankton) are one source of the yellow pigment. Other microscopic plants may color the water brown or brownish-red. Near shore silt or sediment in suspension can give waters a brownish hue; outflow of large rivers can often be observed many miles offshore by the coloration of suspended soil particles.

The color of the sea changes constantly because of clouds passing across the face of the sun or because of the angle of the sun's rays passing through the atmosphere.

Oceanographers record the color of the ocean by comparison with a series of bottles of colored water known as the Forel scale. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

Nature's Nurseries: The Estuaries

Mouth of the Housatonic River showing Milford Point, the Nells Island marsh area, and the city of Stratford, Connecticut, in the background. (Photo: BCF, Milford, Conn.)

The nutrient-rich waters of the bays, sounds, and nearshore areas that border our coastline serve as nurseries for many important species of fish and shellfish; as a home for waterfowl and furbearing animals; and as a recreational and esthetic resource for man. Salmon, shrimp, shad, menhaden, and other fish and shellfish--which contribute two-thirds of the U.S. commercial fishing catch--come to feed and grow in these natural nurseries until they are ready to move to deeper water as adults. Estuaries are truly the "fish basket" of the Nation.

Estuaries are necessary and desirable for man's use. However, without protection based on sound scientific research, these areas can be damaged irreparably. Already, draining, filling, dredging, and pollution by pesticides and chemical and human wastes have altered drastically some estuarine areas.

Estuaries should be managed to benefit all. BCF works with State and Federal agencies to protect these vital natural resources.

BCF has 2 new films on estuarine resources and conservation: "Estuarine Heritage," and "The Biologist and the Boy." These were made in cooperation with the Gulf States Marine Fisheries Commission using PL 88-309 funds. A catalog of films distributed by the BCF library system can be obtained by writing BCF's Audio-Visual Services Unit, 1815 North Fort Myer Drive, Arlington, Virginia 22209.

COMMERCIAL FISHERIES Review

VOL. 31, NO. 5 MAY 1969

COVER: Smoking fish on the Ivory Coast. (FAO/A. Defever)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

Fishermen's Memorial
Gloucester, Mass.

The Bureau of Commercial Fisheries and The Bureau of Sport Fisheries and Wildlife make up The Fish and Wildlife Service of The United States Department of the Interior.

Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

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CONTENTS

Learning the ropes--by mending rips in net. (State)

HICKEL URGES GREATER DEVELOPMENT OF OCEAN RESOURCES

As the world's population multiplies and moves closer to the oceans, the resources of the oceans become an important key to the future of mankind. The challenge of the sea "poses no insuperable scientific or technological barriers. . . . Our major need is for a recognition of the problem and a national commitment to meet it."

This is the major theme of the introduction by Secretary of the Interior Walter J. Hickel to a report urging adoption of that commitment. He asks the United States to develop the leadership necessary to meet the world's needs for the resources of the sea. The report is titled "Marine Resources Development. . .A National Opportunity."

Secretary Hickel writes that America's great agricultural wealth led to neglect of the sea's living resources and to greater dependence on imports--rather than to greater fishery harvests. He warns: "We must reverse this trend. At stake is not simply our ability to feed our own people. . . . The real stake is leadership in a protein-hungry world."

Department Qualified for Task

The Secretary believes his Department is the logical agency to play a leading role in the civilian part of such a new marine resources program. The Department "combines our Government's major capability for marine mineral exploration, recreation, and water quality and supply with its major capability for development, wise use and management of the living resources of the sea."

Of all civilian Federal agencies, Interior Department has the largest interest in the ocean. Its budget for ocean affairs is about 35 percent of total Federal civilian ocean activities. These programs deal with commercial and sport fisheries, oil and gas, minerals, water quality and supply, and recreation.

The Department has about 7,500 scientists and engineers working in resource research and development. Not all of them deal with marine resource problems, but their skills and experience can be brought to bear on these problems when needed. They are trained in all the disciplines required to manage and develop the sea's resources: biology, geology, pollution control, engineering, economics and other social sciences, law, and international affairs.

The Department has marine laboratories near all types of ocean environment. Most of these laboratories are associated closely with universities. The laboratories operate 21 large, seagoing, research ships and smaller vessels.

UNITED STATES

FDA Sets Interim Limit for DDT in Fish

Residues of the pesticide DDT and its derivatives in all fish shipped interstate will be limited to 5 parts per million (ppm). This was the interim guideline announced April 22 by the Food and Drug Administration (FDA).

FDA Commissioner Herbert L. Ley said this ruling is intended to protect the public from excessive levels of DDT in fish while a scientific review is completed. Also, it gives the fishing industry a specific standard. Fish carrying residues higher than 5 ppm will be subject to seizure.

Scientific Study

The National Academy of Sciences-National Research Council has been asked to nominate a panel of experts to review the importance of DDT residues in fish. The 5 ppm interim limit may be changed after that study. Residues of DDT in fish were not considered significant until recently because levels were generally low.

Less Than 1 PPM in 90% of Fish

Pesticide monitoring by FDA indicates that DDT residues are below 1 ppm in 90% of fish marketed in the U.S.

Tolerances for DDT residues in other foods vary. Examples: the tolerance is .05 ppm for milk, that for a wide variety of fruits and vegetables and the fat of meat 7 ppm. FDA has reduced some of these tolerances when experience showed lower levels were practicable.

New Hatchery Technique Produces Cultchless Seed Oysters

"Free" or "cultchless" spat (young or seed oysters) have been developed, report J. D. Andrews and L. W. Mason of the Virginia Institute of Marine Science (VIMS). This may lead to improved oyster culture in the U.S. and abroad. "Spat are separated from artificial substrates at a very early age and grown in trays and tanks without cultch until large enough to plant on beds."

The process was pioneered in 1967 by W. W. Budge and associates at Pacific Mariculture, Inc., Pigeon Point, Calif. Their success stimulated other hatcheries to develop their own method of obtaining "free" spat.

VIMS and the Windmill Point Oyster Co. have developed and are improving ways of producing "free" spat.

The Technique

After about 2 weeks of larval life, oysters attach themselves to a substrate, such as an oyster shell. At VIMS, larvae placed within fine plastic netting or screens are forced to set on threads of the net. They are easily washed off the threads with jets of water. Sand grains or fine particles of shell are also acceptable to the larvae. Young "free" spat are grown in containers about 2 weeks on cultured food or centrifuged river water. Then they are moved to trays in ponds or rivers.

Useful to Industry

VIMS states that commercial hatcheries financed by public and private funds have been struggling to compete in costs with wild spatfalls. A major expense has been washing and handling bulky shells used as cultch. "Now this step can be eliminated." Commercial shellfish hatcheries have been built in Canada, England, France, California, Connecticut, Massachusetts, New York, Oregon, and Virginia. Many are shifting rapidly to production of "free" spat. Methods change often as each lab and hatchery tries to meet its needs.

Benefits and Problems

Many potential benefits and problems are associated with "free" spat, VIMS believes. Some consequences are startling. Millions of spat from one pair of oysters of any species can be shipped anywhere cheaply and efficiently.

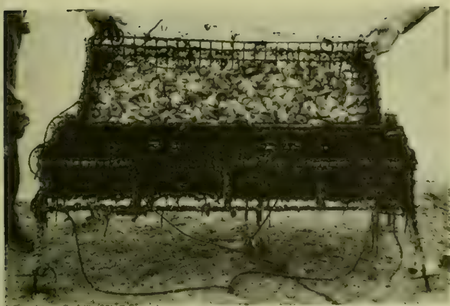


Fig. 1 - Experimental 18 x 40 inch plastic-coated tray with 5 square feet of bottom contains 265 cultchless oysters ($\frac{1}{5}$ bushel) without crowding. The larger legged tray contains more free spat and permits experimentation on natural oyster beds. Simpler open-mesh containers could be designed for suspension from floats, or set on stringers to hold 50 to 100 oysters per square foot through first year.

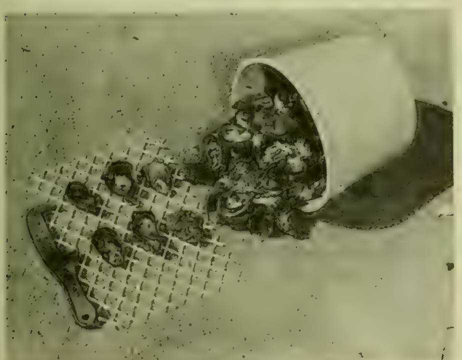


Fig. 2 - Free spat grow into single oysters at one year. The oysters grown in trays in York River from May through November (1968 year class) are ready to plant on natural bottom. The 5-quart bucket contained 120 relatively thick-shelled oysters weighing about one ounce each. Average length is about $2\frac{1}{2}$ inches, as shown by 3-inch culling iron and 1-inch plastic mesh for lining trays. The well-shaped oysters will be marketable in one more growing season. A count of 1,200 per Virginia bushel excels James River stock; in the latter, 1,000 mixed one to 4-year-old oysters is rated good-quality seed. (Photos: VIMS)

VIMS scientists believe this heightens the urgency of genetic studies of oysters, and the necessity to develop fast-growing, disease-resistant strains. Introduction of unwanted oyster species and their diseases may become critical and difficult to control.

The French oysterman, who now offers European, Portuguese, and Japanese oysters, may decide to offer also Chilean and Australian oysters, for example. The Frenchman now pays one-tenth to one cent apiece for seed oysters; this depends on a wild set that fluctuates annually. W. W. Budge hopes to sell his spat for a penny apiece, or less, depending on quantity.

Nursery Techniques

Nursery techniques or methods of growing "free" spat to sizes resistant to predators (crabs, fish, drills, starfish) are a serious problem for hatchery seed. Oyster spat, unlike clams, are not able to reattach or dig into substratum, so they are easily washed away or covered by silt. "The challenge now is to grow 'free' spat in trays or ponds to a size suitable for planting on oyster beds."

The hobbyist who wishes to grow oysters in trays suspended from floats or front-yard pier may benefit from "free" spat sooner than Virginia's commercial oysterman. Half-grown wild seed oysters can be bought at about 10 for a penny. The hobbyist who buys a million "free" spat, $\frac{1}{4}$ to $\frac{1}{3}$ inch--with a volume of perhaps one quart--should be prepared for rapid expansion of his tray space. Without losses, which are inevitable, one-inch oysters grown to $3\frac{1}{2}$ inches will increase in volume 25 times.

In Virginia, "free" spat should be obtained in May to take full advantage of spring and summer growth during the first year. Average conditions should permit marketing or eating tray-grown oysters in 2 years.

"Chesapeake Bay has a relatively large supply of wild oysters for harvesting and transplanting," VIMS states. So hatcheries and "free" spat are probably not competitive here but may be in Long Island, N.Y. Interest is high in Virginia.

Below-Average Hawaiian Skipjack Season Forecast

Hawaii's largest fishery--that for skipjack tuna--may turn out to have another discouraging season. This is predicted by scientists of BCF's Biological Laboratory at Honolulu.

They forecast a 1969 catch smaller than the long-term average of 10 million pounds. The lowest catch of recent record was 6 million pounds in 1957; the highest was 16 million pounds in 1965. If the scientists are correct, it will be the fourth consecutive catch below long-term average.

Water Warms Late

Their forecast is based on the time when the waters off Oahu begin to warm. Warm water of low-salinity is associated with good skipjack tuna seasons. This year, the warming has begun late--"an ominous sign for the fishery."

New Shoals Located During EASTROPAC Cruises

Continuous traces of the ocean bottom made by BCF's 'David Starr Jordan' during EASTROPAC cruises have revealed shoals in the eastern Pacific not previously recorded on navigation and oceanographic charts. These are:

Depth (Fathoms)	Position
870	10°34' N., 111°21' W.
1,285	10°17' N., 111°20.8' W.
820	9°20.5' N., 111°20' W.
1,445	16°05' N., 107°24' W.
1,100	6°05' N., 104°47' W.
230	13°16.5' N., 118°53.0' W.

BCF La Jolla believes: "This information should be of considerable interest to fishermen since tuna tend to congregate at such shoals, although some of these spots are probably deeper than those which aggregate fish."

Underutilized Species Have New Market Potential As Feed

The potential U.S. demand for improved feed made from fish for marine mammals in zoos and aquaria has been estimated by BCF's Technology Laboratory in Seattle, Wash., at 20,000,000 pounds; the foreign market at 10-20,000,000 pounds. The lab is developing such feed. There is also a potential market in feeding pets and ranch fur animals.

BCF's Pacific Northwest Region says: "This type of product appears to hold great promise as a market outlet for such underutilized species as hake and herring."

BCF's Seasonal Alewife Survey Is Underway

BCF's research vessels 'Kaho' and 'Cisco' are conducting a coordinated fishery resource assessment survey along the eastern and western shores of southern Lake Michigan from April 29 to May 15, 1969. This survey is made each spring and fall to obtain life history and population dynamics information on alewife and other important fish stocks, such as chubs, salmonids, and yellow perch.

The Kaho is operating off Waukegan, Illinois, and Port Washington and Manitowoc, Wisconsin. The Cisco is operating off Benton Harbor, Saugatuck, and Ludington, Michigan.

Kinds of Data

Both vessels are fishing the standard biological assessment net, a 39-foot North Atlantic whiting trawl with $\frac{1}{2}$-inch mesh (stretched measure) cod end. The data collected include numbers of each species, total species and individual weights, scale samples for age determinations, sex ratios for all species, and stomach content information for salmonids. Abundance and availability information about commercially important species will be made available.

Lake Oahe Commercial Catch Increases

In recent years, commercial catches from Lake Oahe (South Dakota) have increased steadily in weight and value:

Year	Quantity	Value
	Lbs.	$
1966	297,400	31,005
1967	548,300	58,064
1968	754,000	80,000

In 1968, buffalo, carpsucker, and goldeye accounted for 90% of the catch. BCF-developed floating hoop nets landed 19% of the total catch and 28% of the buffalo catch, though few were used.

Some 1,200 lifts were made with the modified hoop nets, 4,000 lifts with standard hoop nets. The BCF-modified hoop nets were about 1.8 times more effective. They took an average of 117 pounds per lift compared to 65 pounds for standard hoop nets.

This small-value commercial fishery contributes welcome income in a region of sparse population and limited income opportunities.

Import Quota Set for Tuna Canned in Brine

The quantity of tuna canned in brine that may be imported into the U.S. during 1969 at the 10% rate of duty is limited to 71,703,494 pounds. This is equivalent to about 3,414,452 cases of 48 7-oz. cans. Any imports above the 1969 quota will be dutiable at the rate of 20% ad valorem. The 1969 quota is 7% greater than in 1968, and 3.2% above 1967.

The 1969 quota was reported by the U.S. Bureau of Customs. It is based on the U.S. pack of canned tuna during the previous year (1968) reported by the U.S. Fish and Wildlife Service.

U.S. Agency Loaned $10 Million to Fishing Industry in FY 1968

Between July 1, 1967, and June 30, 1968, the Small Business Administration approved 342 loans to the fishing industry (including fish processing and distribution) totaling nearly $10 million.

The 2 largest loan categories were $6,244,729 of "business loans," which went mostly to feed manufacturers, and $2,134,049 in disaster loans, mostly to shellfish fishermen.

Fishermen and Hunters Spent Record $168 Million in Fiscal 1968

Fishermen and hunters spent a record $168 million for licenses, tags, permits, and stamps during fiscal year (FY) 1968, Interior Department's Bureau of Sport Fisheries and Wildlife (BSFW) has announced. It was nearly $14 million more than the previous high in FY 1967.

Fishing-license holders increased 930,670 to a new high of 23,060,332. Hunting-license holders numbered 14,931,270, up 245,538 over a year earlier.

BSFW pointed out that license sales are not accurate measure of the numbers of hunters and fishermen. In some States, sportsmen must buy separate licenses, stamps, permits, or tags to catch different kinds of fish or game. Also, most States do not require persons above or below certain ages to buy licenses; and most coastal States do not require licenses for saltwater fishing. Many persons hunt and fish in more than one State and so are counted more than once.

The figures do show that hunting and fishing are increasing sources of recreation.

Major Revenue for States

License fees are a major source of income for States in carrying out their fish and game programs. State fish and game departments certify the number of paid hunting and sportfishing license holders to BSFW for use in distributing Federal Aid in Fish and Wildlife Restoration funds to the 50 States.

Water Standards of All 50 States Now Approved

On April 29, Interior Secretary Hickel approved the water quality standards of Kansas, the 50th state to join in a National effort to enhance and protect the quality of water resources.

Secretary Hickel said: "This puts us over the first big hurdle toward better water in this country. We now have a working basis for upgrading and protecting the water resources in all 50 states and the other

jurisdictions involved. Some of the standards still need improvement, and there is a big job ahead in meeting all of them. But we are on our way."

Standards also have been approved wholly or partly for Washington, D. C., Delaware River Basin, Puerto Rico, Virgin Islands, and Guam.

The standards of 24 states have been fully approved; the standards of other states were approved with some exceptions that remain to be worked out.

Some State Levels Higher

Non-degradation provisions in the standards--designed to maintain water quality where it is now higher than the limits set by the standards--have been approved for 19 states, Puerto Rico, Guam, and Washington, D. C.

The standards program was authorized by the Water Quality Act of 1965. It covers all interstate and coastal waters. The standards are subject to both State and Federal enforcement.

In addition to interstate standards, some States also have set similar standards for intrastate waters.

Coast Guard Says Boat Capsizings Claim Most Lives

Boating accident statistics compiled by the U.S. Coast Guard (CG) show that more lives have been lost because of boat capsizings than any other single cause. According to the Chief of CG's Office of Boating Safety, many of these fatalities could have been avoided had the victim known the right thing to do.

What To Do

CG states that a boat's occupants often are not injured when thrown into the water. Most drownings that follow capsizings result from improper actions by the victims.

CG offers a few rules to save lives: (1) Use CG-approved lifesaving devices; (2) Stay with the boat; (3) Keep calm. "By staying with the boat, a person thrown into the water increases his chances of being spotted by rescuers. Statistics show that in most cases swimming ashore is the wrong thing to do."

By regulation, CG-approved devices, one for each person, must be carried on every motorboat. "When not being worn, they must be readily available. Crewmen and passengers should know how to use them."

Coast Guard Recommends Marine Radio Distress Procedure

The U.S. Coast Guard emphasizes that proper marine radio procedure is vitally important to the vessel in distress. A distress situation often produces confusion. Existing procedures for communications by marine radio can be helpful. The best thing a crew can do is to keep calm and follow the procedures.

International Distress Procedures

The International Radio Regulations, updated by the International Telecommunication Convention (Geneva, 1959), designate the proper format for distress calls. The format is simple: The word "MAYDAY" 3 times on a distress channel, 2182 kilohertz or 156.8 megahertz; followed by "THIS IS"; the NAME of your vessel, 2 times. This should be followed by vessel's POSITION, a DESCRIPTION of vessel, and TYPE OF ASSISTANCE required. Also include any other IMPORTANT INFORMATION. Repeat call often, until answered. If no one replies, continue the call for help.

The Coast Guard states that all crewmen should be familiar with the procedures of making a distress call. Everyone should be briefed about the radio and its proper use in an emergency.

Marine Technology Society Conference Slated for Florida June 16-18

The Marine Technology Society will hold its fifth annual conference at the Fontainebleau Hotel in Miami Beach, Fla., June 16-18. Theme: "The Decade Ahead: 1970-80."

The planners expect 2,500 people to attend--ocean engineers, marine systems managers, scientists, and oceanographers. Speakers will include Vice-President Spiro Agnew.

Conference cosponsors are the Florida Commission on Marine Sciences and Technology, the University of Miami, and the International Oceanographic Foundation.

Green Dye Treats White Spot Disease in Catfish

Auburn University is using a green dye to cure the fatal white spot disease in catfish. The dye, Victoria Green S Extra Concentrate, is made by the GAF Corporation, a New York-based chemical producer, which reported the dye's use on catfish.

White spot is caused by a one-cell protozoan that attaches itself to the catfish--and literally gets under its skin. White spot disease has been known to destroy an entire fish crop within a few months. Dr. Ray Allison, a fish-disease expert at Auburn, says he has not figured out how the dye does the job, but that it does.

"Isk"

GAF reports a survey of Alabama catfish farmers indicates many farmers are using the green dye to combat "Isk" (short for Ichthyophthirius) as the parasites are commonly called. The dye has a germicidal effect on the parasite; it destroys the life cycle.

The catfish farming season runs 10 months. Fingerlings stocked in ponds in February reach marketable size of about one pound each by late fall. ('Oil, Paint and Drug Reporter,' April 28.)

BCF'S WOODS HOLE LAB PARTICIPATES IN PROGRAM FOR BLIND CHILDREN

The Connecticut Valley Shell Club in Springfield, Massachusetts, has undertaken the very worthy project of helping blind children become acquainted with sea shells. Shells donated by club members, organizations, and interested individuals are assembled by the members and evaluated for possible use by students at the Perkins School for the Blind in Watertown, and the Walter E. Fernald State School in Waverly. Then the shells are examined by a rehabilitation counselor of the State Commission for the Blind for usefulness and "interest by sense of touch". The selected specimens are incorporated into one or 2 collections.

One collection (teaching collection) consists of 50 specimens, each of several different kinds. Each child examines by touch the same species of shell while the instructor describes it and relates its biological habits, uses, etc. The other collection consists of a display series which contains only one specimen of many different kinds of shells. These are assembled and kept in special styrofoam cases. Each shell is numbered in braille to correspond with the numbered master list, also in braille, which gives the name of each shell.

Personnel at the BCF Biological Laboratory at Woods Hole, Mass., are proud to have supported this project in a small way by collecting mollusk shells from the New England fishing banks.

Fishery Legislation Proposed in Congress

House Votes to Extend Marine Resources and Engineering Development Council

On April 21, the House of Representatives passed H.R. 8794. This would change the expiration date of the National Council on Marine Resources and Engineering Development from June 30, 1969, to June 30, 1970. The bill also reduced the annual appropriation from $1,500,000 to $1,200,000. On April 22, the House-passed bill was referred to the Senate Committee on Commerce.

Senate Action

On the same day, Sen. Magnuson, Wash., introduced for himself and others a Senate bill to continue the Council (S. 1925). He feels the Council must continue its work without interruption until at least June 30, 1970. He noted that the Council has appointed 5 committees to undertake studies in marine science and technology and to submit recommendations.

The Committees are: the Committee on Multiple Use of the Coastal Zone, on which the Council is placing greatly increased emphasis, headed by the Assistant Secretary of the Interior for Fish & Wildlife and Marine Resources, and committees on Marine Research, Education and Facilities; Ocean Exploration and Environmental Sciences; Food From the Sea; and International Policy in the Marine Environment.

Council Publications

Sen. Magnuson also pointed out that the Council solicited the views of non-Federal organizations and individuals with capabilities in marine science. It then awarded 24 contracts to various industries, research organizations, and institutes for technical and highly specialized studies. Fifteen have been completed and are available, for a nominal charge, from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Va. 22151. Two more, 'Gulf of Mexico Research and Environmental Programs,' and 'Legal Aspects of Great Lakes Resources,' should be available soon. 'Multiple Use of Lakes Erie and Superior' is nearing completion.

Passage of Water Pollution Control Amendments Nearly Unanimous

By a record vote of 392 yeas to 1 nay, the House passed H.R. 4148 amending the Federal Water Pollution Control Act, and agreed to amendments that:

1) direct the Secretary of the Interior to make a study of any and all methods of financing the cost of preventing, controlling, and abating water pollution;

2) provide for the presentation of awards to private industry and local governments for excellence in their water pollution programs; and

3) provide for a Great Lakes water control demonstration.

The House rejected amendments that sought to:

1) place controls on the effect of thermal pollution by nuclear reactors;

2) provide for the establishment of a national pollution disaster area;

3) delete the sections regarding training grants and contracts and scholarships from the bill;

4) prohibit the States from enforcing antipollution regulations against any vessel subject to provisions of the act; and

5) bar the dumping of dredgings into the Great Lakes by the Army Corps of Engineers.

Fishing Fleet Expansion

Sen. Magnuson also introduced a bill to provide a new maritime program (S. 1915, Apr. 22). Studies and negotiations with administration and industry officials were held on a similar bill in the 90th Congress (S. 2650). Sen. Magnuson said the new bill will broaden eligibility for construction subsidies. It also will provide an extension of the tax-deferred capital reserve fund program to all U.S.-flag operators in the foreign and domestic trades, and to fishing vessel operators. At present, the program is in effect for the subsidized operators.

Reimbursements to Commercial Fishermen

On April 18, Sen. Hart, Mich., introduced S. 1889. This bill would provide partial reimbursement for losses incurred by commercial fishermen as a result of State-imposed restrictions on commercial fishing.

--Barbara Lundy

OCEANOGRAPHY

Map Seabed Off Northern California

An imposing undersea ridge and canyons more than a mile deep are depicted on a new bathymetric map of the seabed off Northern California published by ESSA's Coast and Geodetic Survey (CGS). The map covers about 13,000 square statute miles of sea bottom and extends from 87 to 107 miles seaward off California from the Oregon border to Point Delgada. It is the most detailed bottom topography of the area ever published. The map is one of a series planned by CGS for the seabeds off the Atlantic, Pacific, Alaskan, and Gulf coasts.

Ridge & Canyons

The major undersea features shown include part of the Mendocino Ridge and the Mattole, Trinity, and Eel Canyons. About 85 miles of the ridge, one of the most outstanding underwater features off the coast, are seen. The ridge's steep north side rises sharply 7,000 feet from ocean floor 25 nautical miles off Punta Gorda and extends due west 2,000 miles. The ridge's sloping south side drops over 8,300 feet at a point southwest of the Gorda Escarpment.

The Mattole Canyon starts at a depth of 32 feet about a $\frac{1}{4}$ mile from shore and drops to 6,500 feet within 20 miles. The Eel Canyon begins at 250 feet 6 miles from shore and falls to 8,200 feet within 20 miles. The Trinity Canyon begins at 3,900 feet 22 miles from shore and drops to 9,800 feet within 22 miles.

Imposing undersea ridge and canyons more than a mile deep are depicted on new bathymetric map of seabed off northern California published by ESSA's Coast and Geodetic Survey.

CGS Maps

The bathymetric maps are designed to aid Federal, state, and industrial interests in exploring and developing the potential resources of the Continental Shelf.

Foreign Fishing Off U.S. in March 1969

NORTHWEST ATLANTIC

Good weather in March permitted excellent coverage of foreign fishing from south of Nova Scotia to Cape Hatteras. A total of 218 Soviet, Polish, Spanish, Japanese, Norwegian and East German fishing and support vessels were sighted. This was 17% more than the 182 sighted in Feb. 1969.

Soviet vessels--125 early in the month and about 175 by the end--included 20 factory stern trawlers, 135 medium side trawlers, 6 factory base ships, 6 refrigerated transports and cargo ships, 1 tug, and 1 tanker. (In March 1968, about 125 had been sighted off southern New England, New York, and New Jersey.)

During first week, 70 medium side trawlers and 10 support vessels were dispersed north and south in a 30-mile area, 20 to 40 miles east of Oregon Inlet, N.C., to 20 miles east of Cape Hatteras. Moderate catches in open deck storage areas appeared to be sea herring.

By midmonth, 95 medium side trawlers and 5 factory base ships were in a 15-mile area, 17 to 20 miles east of Oregon Inlet. Huge catches of herring, which filled open deck areas on most trawlers, also were heaped in open storage areas on several huge factory base ships.

By the third week, fleet had increased to estimated 165 vessels--143 medium side trawlers, 10 support ships, and 12 factory stern trawlers. Some 148 were in a 35-mile area, 35 to 50 miles east of Currituck Sound, N.C. Huge catches of herring on the side trawlers were being placed directly into barrels. Some catches were so excessive, covering all deck areas, that fish were unloaded directly from the trawler. A large bucket was used to hoist the fish aboard the base ship. The base ships and transports also held huge amounts of fish in open storage areas.

Factoryship 'V. Putintsev' nested with refrigerated transport 'Visili Perov'; 'SRTM 8-407' alongside. These vessels are on shrimp grounds in Portlock Banks. (Photo: Branson)

OFF SOUTHERN NEW ENGLAND

Soviet: Early in March, 15-20 stern trawlers fished along the 50- and 100-fathom curve, from south of Nantucket to south of Block Is., R.I., just beyond eastern boundary of 'no fishing' zone, in ICNAF subarea 5. Catches, primarily red hake, included some herring. By third week, about 10 had shifted to areas off North Carolina and Virginia. The others remained south of Nantucket.

OFF MIDATLANTIC

Soviet: The largest fleet concentration was off North Carolina and Virginia; only a few scattered vessels fished off New Jersey.

About 10 factory stern trawlers (previously fishing red hake off southern New England in subarea 5) fished in deeper water a few miles east of the main concentration. Moderate-to-heavy catches were observed on board. Several hauls were estimated at 25,000-35,000 pounds.

A group of 17 vessels caught moderate amounts of herring 50 to 55 miles east of Chesapeake Bay.

Late in March, an estimated 100 Soviet vessels--mostly side trawlers, with 11 base ships and support vessels--were located about 60 miles east of Chesapeake Bay entrance.

Polish: Early in March, 5-6 large side trawlers and 1 factory base ship were 30-35 miles east and southeast of Cape May, N.J. Small catches of herring were observed. By third week, they had shifted south to join a small group of Soviet vessels 50-55 miles east of Chesapeake Bay. Large catches of herring were observed.

Late in month, 22 large side trawlers and 1 factory base ship (with good catches of herring) were sighted in a 15-mile area, 60 miles southeast of Cape May.

Japanese: 5 stern trawlers were sighted. On March 18, 2 were 60 miles south of Montauk Point, L.I. On March 24, all 5 were about 70 miles south of Nantucket. No catches were noted.

Spanish: On March 18, 10 pair trawlers--4 stern and 6 side trawlers--worked along northeast peak of Georges Bank. No catches were observed, although this is a productive cod area. Several U.S. fishing captains reported 40 vessels (stern and side trawlers) working southeast part of Georges Bank from mid-February to early March. (About 30 Spanish vessels had been reported on eastern slopes of Georges Bank in March 1968.) This number had decreased to 6 or 8 by mid-March.

East German: Early in March, a single freezer stern trawler was sighted in the large Soviet fleet off North Carolina.

Norwegian: On March 18, the long liner 'Koralhav' was sighted on winter fishing grounds of Georges Bank. No catches were noted.

U.S.-USSR MIDATLANTIC FISHERIES AGREEMENT

No Soviet vessels were observed in the 'no fishing' zone. Three to 5 vessels often conducted support activities in the Long Island loading zone.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign vessels were reported fishing in March 1969.

OFF CALIFORNIA

Soviet: One stern trawler was sighted not fishing about 25 miles off Eureka on March 5. On March 19, the same trawler, 3 other stern trawlers, and one side trawler fished 15-18 miles west of San Francisco Bay. No catches were observed.

The research vessel 'Professor Deryugin' was in Los Angeles harbor, March 21-26, to take on fuel, water, and food. She also picked up U.S. gear for hake population survey she is conducting with BCF and Scripps Institution of Oceanography. She will be off California and Baja California for about 6 weeks.

OFF PACIFIC NORTHWEST

Soviet: Two fishing vessels were sighted in March--Professor Deryugin on way to Los Angeles and a stern trawler fishing off Oregon. No catches were observed. (16 vessels were sighted in March 1968.)

Japanese: Two long liners were sighted 3 times. During first week, quantities of what appeared to be ocean perch were observed on one vessel. (In March 1968, there were 2 stern trawlers and 1 long liner.)

OFF ALASKA

Soviet: Between 160 and 165 fishing and support vessels were sighted in March, about the same number as in February. Effort in the central Bering Sea herring fishery declined as the eastern Bering Sea king crab fishing and Gulf of Alaska shrimping began. (In March 1968, about 100 Soviet vessels fished off Alaska.) The 60% increase in March 1969 was due to expanded effort in both central Bering Sea herring fishery and eastern Bering Sea flounder fishery.

In previous years, the eastern Bering Sea flounder fishery had declined in March. This year, about 70 vessels--25 factory trawlers, 30 medium trawlers, 13 factoryships and refrigerated transports, and 2 other support vessels--worked throughout month. Besides flounder, small quantities of Alaska pollock

were seen in catches of some trawlers. The fishery's longer-than-normal duration at such a high level may be due to the fact that fishing for pollock began as flounder catches declined. Pollock are used mostly for fish meal.

Herring catches in central Bering Sea may not be falling off as sharply as in the past. The number of vessels did not decline as rapidly as in previous years. At month's end, there were about 23 stern trawlers, 25 medium trawlers, 12 factoryships, refrigerated transports and other support vessels. Formerly, only a few vessels still remained at the end of March.

The 18 medium trawlers fishing bottomfish--primarily arrowtooth flounder and sablefish, and possibly Alaska pollock--off Continental Shelf edge in eastern Bering, decreased to 12 during month. Most of departing vessels moved into Gulf of Alaska to fish shrimp.

In mid-March, 1 factoryship and 3 tangle-net setting trawlers started eastern Bering Sea king crab fishery on the Continental Shelf edge north of Alaska Peninsula. By late March, a second factoryship, 3 more net-setting trawlers, and probably 2 exploratory vessels had joined them. This fishery was conducted at the 1968 level.

Two factoryships and 10 medium trawlers had begun fishing shrimp on Portlock Bank, east of Kodiak Is., in Gulf of Alaska, by end of March (about 2 weeks later than in 1968).

Japanese: Vessels increased from about 30 at end of February to about 125 by mid-March. The increase was due to arrivals in eastern Bering Sea minced fish meat and meal fishery--and to start of annual eastern Bering Sea crab fishery.

The ocean perch fishery continued at extremely low level. Gulf of Alaska fishing was over by month's end, but about 4 stern trawlers were still fishing in eastern Bering Sea.

In early March, eastern Bering Sea trawl fishery for flatfish and Alaska pollock increased from 1 factoryship and 6 trawlers to 3 factoryships, about 76 trawlers, and 2 reefers. This fishery centers on and along Continental Shelf edge just north of Unimak Pass.

Twelve trawlers, supported by at least 1 factoryship serving as a refrigerated transport, continued herring fishery in central Bering Sea northwest of Pribilofs (close to Soviet herring fishery).

The annual crab fishery on Continental Shelf, north of Alaska Peninsula in eastern Bering Sea, began in 2nd week of March with 2 factoryship fleets. One fleet used only pots (pots are very selective for tanner crab); the other, primarily fishing pots, also used tangle-net gear. The 2 factoryships are licensed to be accompanied by 30 trawlers or schooners, which serve as pot tenders and tangle-net setters. The catch of one fleet, observed during a boarding, was about 90% tanner crab and 10% king crab.

Long liners fishing sablefish in Gulf of Alaska, off southeast Alaska coast, increased from 2 to 4 during the month.

STATES

Alaska

1969 HERRING PROSPECTS

Prospects for the Southeastern Alaska herring-egg-on-kelp fishery are poor, reports BCF Juneau. This fishery is centered at Craig, Hydaburg, and Sitka. In 1966, it produced 660,000 pounds worth $496,000 in a fishing season of only a few hours.

Herring spawning in the Craig area is down with only 6 lineal miles of spawn--compared to an average of 12 miles; deposition on the commercially desirable kelp is limited.

Although spawning occurs slightly later in the Hydaburg and Sitka areas, the situation appears the same.

But catches of herring for sac-roe are likely to increase in Alaska's south-central area. The 1968 Kodiak herring catch was 2,524 tons. A similar fishery will be conducted in 1969. Also, negotiations have been completed for Prince William Sound herring to be delivered to Korea in dry-salted form. Korean facilities will extract the roe, and the carcasses will be prepared for markets in other ways.

Experiments This Year

There will be considerable experimentation this year with methods of inducing herring to spawn on artificial surfaces--which are to be recovered later as a form of spawn-on-kelp and salt cured for a Japanese market.

In the Kodiak area, a plastic ribbon will be tried as a substitute for kelp. Also, kelp shipped in from California will be placed in spawning locations. In Prince William Sound, a similar experiment will be tried using dried kelp brought from Japan.

* * *

LIFT BAN ON AIRSHIPPING LIVE CRABS

The 1969 Alaska State Legislature lifted the ban on airshipping live crabs.

Back in 1964 the legislature passed a regulation making it unlawful to ship live crab from Alaska. It was feared then that large vessels with live tanks would transport crab to Seattle, Wash., for processing. This would eliminate jobs for Alaskans. Primary processing of crabs became mandatory within Alaska.

BCF's Alaska Region believes "the reasoning is still valid. However, the air shipment of live crabs is an entirely different concept. The crabs would be landed in Alaska ports by Alaska licensed fishermen, prepared for shipment by Alaska labor, sold and shipped by Alaska dealers and carried by airlines serving Alaska. Over the last several years improvement in aircraft serving Alaska and technological developments in packaging and handling live crabs has opened the way for a large and lucrative market for prime Alaska Dungeness crabs."

California

"FISH-LIFT" PLANNED TO INCREASE SALMON RUNS

The California Department of Fish and Game (DFG) has launched a very large "fish-lift" to help young salmon down the Sacramento River and to bolster future runs of king salmon. DFG Director Ray Arnett said in April that about 15 million fish--weighing 167,000 pounds--will be hauled from state and Federal hatcheries in special fish-planting trucks and released in the Sacramento-San Joaquin Delta near Rio Vista over the next 5 months.

The program started April 1. It will continue through mid-September 1969 as part of DFG's stepped-up management program to rehabilitate the Central Valley's king salmon resources.

Salmon Runs Drop

Salmon runs have declined in recent years. This caused serious concern for the future of this vital resource, which contributes greatly to sport and commercial salmon catches on the Pacific Coast. This year there was a slight increase in spawning runs.

George Warner, Chief of DFG's Anadromous Fisheries Branch, said: "Tests over the past few years have shown that Sacramento River salmon fingerlings trucked downstream to the Delta for planting return in larger numbers than those planted at the hatchery. Accordingly we are going to move fish downstream from Nimbus and Feather River hatcheries, and the U.S. Bureau of Sport Fisheries and Wildlife also has agreed to plant 50 percent of the fingerlings from Coleman National Fish Hatchery downstream."

Warner noted that the downstream migration is a critical period for juvenile salmon. The downstream release will increase their survival and later contribution to salmon catches. Greater returns of adult salmon to the spawning grounds also are expected.

Apparently because of the time they spend in homestream waters at hatchery rearing ponds, the salmon trucked to release sites show just as strong a "homing instinct" when they return from the sea as those released at the hatchery.

Warner added: "We believe this program of raising salmon to the 90-to-the-pound size and trucking them downstream will do much to restore our salmon runs."

June 1 Biggest Day

The biggest single day of the operation will be June 1, 1969. Then, 15,000 pounds of fish from Coleman Hatchery will be trucked to Rio Vista for release.

Of the total 15 million fish, about 9 million will be from the Federal Coleman Hatchery, and 6 million from the state-operated hatcheries at Oroville and Nimbus.

Other phases of the accelerated management program include quickened "program of screening irrigation diversions to prevent loss of downstream migrants; fish salvage operations at the state and Federal pumping facilities in the Delta; coordinated hatchery management; and agreements with water-development agencies to improve flows during critical migration periods on the San Joaquin River."

* * *

STURGEON YIELDS TAG ATER 13 YEARS

A sturgeon tagged in San Pablo Bay by California's Department of Fish and Game (DFG) was caught by a Sacramento angler 13 years and 115 days later. It was a record for tagged sturgeon in California. The angler promptly returned the tag to DFG and asked for information about the sturgeon.

DFG told him that tag Number B5812 was affixed to a 62-inch sturgeon on Nov. 17, 1954. Its biologists said they would have to examine the fish closely to be sure of its exact age. However, they guessed it was 29 to 32 years old when caught on March 12, 1969, about one mile south of the Richmond-San Rafael Bridge. It was 77 inches long and weighed 102 pounds.

Oregon

FISH COUNTING IS NOW TELEVISED

The television screen at Willamette Falls Fishway in Oregon City, Oregon, is full of fish, reports BCF's Northwest Region. A new process is being used to count adult salmon returning from the Pacific Ocean through the Columbia on their way to Willamette River spawning grounds.

Counting fish to inventory and identify annual runs of salmon--chinook, coho, sockeye and steelhead--has always been an important job on the Pacific Coast. For many years at the Columbia River dams, alert women sat at stations to watch the fish as they passed. The women identified and tabulated them as they flashed across a horizontally placed, white counting board set near the exits of fish ladders.

Now a closed-circuit TV camera, connected to a digital counter with a video-tape machine, is used to record the salmon as they migrate upstream.

The New Technique

At the Willamette Falls Fishway, in 1968, it was found that by placing a TV camera and video-tape equipment in the fish ladder, one person in about one hour could count fish

passing during a 24-hour period. Specially adapted triggering equipment makes it possible for the fish to turn the video tape recorder on and then off as they pass in front of the camera.

The new method was developed by the BCF Columbia Fisheries Program Office in Portland. The Fish Commission of Oregon is cooperating with BCF.

How It Works

Robert D. Pollock, hydraulic engineer with BCF, was instrumental in developing the TV video-tape technique. He explains that the fish counting and TV recording system is accomplished as water passes through 2 stainless steel tunnels; the inside walls of these tunnels are insulated. Electrodes are imbedded into the inner surface of each tunnel to make electrical contact with the water. The water's conductivity between these electrodes forms a very weak electrical shield. When a fish penetrates the shield, the circuit is broken, the video tape machine activated, and the fish is on TV.

The conductivity bridge principle to count fish was developed initially by BCF Seattle.

A fish-viewing window set between the 2 tunnels, placed end to end, allows a passing fish to trigger the first tunnel--and to activate the video-tape machine. As the fish proceeds past the second tunnel, the tape machine is automatically shut off. If the fish does not pass through the second tunnel, an automatic timer can be set to turn off the video machine at any selected time. This system provides 24-hour surveillance. It has the added advantage of being able to stop motion on playback to give positive fish identification.

Past experience has shown that fish passage is periodic. It may occur at various times during the year and during the day. The night count is 2 to 8% of the day count. By using video tape, it is possible to compress the maximum day's fish passage into about a one-hour reel, without fear of human error. Identification of salmon is made perfect by replaying the tape any number of times. For greater economy, the tape can be erased automatically and new pictures taken on the same roll.

Studies by the Fish Commission of Oregon and by BCF showed that as much as a 20% fish-counting error had been experienced on Columbia River dams. Use of a side-view window and TV video-tape counting reduces the chance of error to a minimum.

* * *

STATE PLANS TO DEVELOP WILLAMETTE'S SALMON POTENTIAL

A 10-year program to develop the potential for "self-sustained natural production" of Willamette River salmon and steelhead through intensive adult and juvenile planting was announced on April 16 by Robert W. Schoning, director, Oregon Fish Commission. He said the opportunity exists now to provide the sport and commercial fisheries of the Pacific Coast with an additional annual harvest of about 800,000 naturally produced fall chinook and coho salmon and summer and winter steelhead.

Contributing to this opportunity were recent improvements in water pollution control and water quality standards, and the correction of many fish-passage problems in the Willamette system. Most important is the $4 million fishway BCF and the Fish Commission have undertaken at Willamette Falls, "the historic natural barrier to upstream migration of summer and fall run salmon and steelhead."

The Potential

The contribution to Oregon alone from natural production in the Willamette River can be increased 500%, the Fish Commission believes. The annual processed value of Oregon's share of the increased commercial catch would approach $875,000. The increased sport harvest in Oregon would generate about $1.5 million spending a year by sport fishermen and provide 150,000 angler-days.

This great potential could be developed by 1979 for about $1.4 million to rear and transplant adult and juvenile fish into the Willamette system. When the program is complete, "the sport and commercial benefits to Oregon are expected to exceed annually the total cost necessary to achieve full development by 1979."

Planting Program Underway

The Fish Commission already has a planting program for these species. Since 1964,

the commission and the Fish and Wildlifee Service have developed successfully a nucleus run of fall chinook in the Willamette above the falls. Many adult and juvenile coho salmon and winter steelhead from commission hatcheries also have been transplanted into the Willamette sysem.

The results are obvious. Fall chinook, coho, and winter steelhead are returning to spawn in Willamette River tributaries "historically devoid of these fish." The 1968 runs of fall chinook and coho passing Willamette Falls were the largest on record.

However, the commission says the Willamette's unused potential "is so great that even at the current rate of progress there is no hope of achieving full development for all species in less than 30 years or more"--unless money and existing developmental efforts are increased appreciably.

Otherwise, Director Schoning says, Oregon will continue to forfeit for an unnecessarily long time much of the annual self-sustained economic and recreational benefits that full development would provide.

Catfish Farming Has Promise for South

Catfish farming, a new multi-million dollar agricultural enterprise, is opening up economic opportunities for many people in the southern United States, it is pointed out by the Soil Conservation Service of the Department of Agriculture.

This is real fish farming--planting, feeding, harvesting and marketing the fish on a scientific scale--and not just turning loose some catfish in a farm pond and charging a fee for fishing. Farmers, who in the past planted a few catfish in their farm ponds, are discovering that with a little management they can raise a profitable crop of fish every year. Some of those who have gone into commercial catfish farming are producing as much as 1,200 to 1,600 pounds of fish per acre of water with net returns of from $70 to $250 per acre.

There is, as far as we know, only one catfish hatchery in South Carolina--the Wadboo Hatchery at Moncks Corner. . . .

They [owners] started operating in March of 1968 and have already sold 130,000 fingerlings from the hatchery, the selling price being a penny an inch. They say they could have sold three times as many fingerlings if they had only had them.

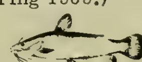
The fingerlings went to persons who wished them for stocking their fishing ponds and to other persons who wished to raise them for eating.

The catfish, primarily the channel and blue species, are marketed through fee fishing, restaurants, fish markets and processors. Farmers either purchase or raise their own fingerlings and stock them in larger ponds in early spring. The fish are fed a high protein pelleted food throughout the season and are ready for harvest in the fall at weights of from one to two and one-half pounds. Some farmers keep them on feed for another year and market them at two and one-half to four pounds.

SCS technicians have helped many farmers throughout the South with information on selecting pond sites, design, and construction and on the management requirements needed to successfully raise catfish. They point out to prospective fish farmers that operation on a commercial scale takes a sizable investment and demands managerial skills.

The typical catfish farm consists of about 20 acres of surface water divided into about eight ponds ranging from one to four acres in size, although a few large scale farmers have as high as 400 acres under water.

At present there are more than 20 million pounds of catfish on feed throughout the southeast and frozen food processors are eying markets outside the South for a product they feel will compete with other foods. (This article is reprinted from 'South Carolina Wildlife,' Spring 1969.)



Texas

SHRIMP CREWMEN TRAIN AT FREEPORT

A shrimp crewmen training venture unique in Texas shrimping is underway at Freeport. Called the National Fisheries Training Center No. 1, it was established in November 1968. It is the first devoted solely to the overall training of apprentice rigmen for the Texas shrimping fleet.

Under a contract awarded by the U.S. Department of Labor to the Freeport Shrimp Association, a consortium of boat owners has been formed to participate in the program. The owners are sponsoring the training program and placing qualified trainees on board their boats during the on-the-job phase of the training schedule.

Origin of Program

This venture resulted from the realization by boat owners and individual boat captains that they had 2 prime difficulties: 1) There was a decided lack of men who could be recruited as crewmen. 2) Boat owners and captains were unable to furnish, on a recurring basis, the training required by the inexperienced personnel they were able to recruit. These people often lasted only 1 or 2 trips. Moreover, the time and facilities available for even rudimentary training of inexperienced personnel while on a trip seriously affected normal shrimping operations--to the point where trip costs rose and size of catch diminished.

The Disadvantaged

Quite apart from these difficulties was the training and jobs program under the auspices of the National Alliance of Businessmen to find gainful, permanent employment for disadvantaged people. In this category are male youths who are job hoppers, school dropouts, and who are on a low rung of the economic ladder. Their outlook went no farther than qualifying for the relief rolls. At this point, through the efforts of the Department of Labor, the NAB, and the Freeport Shrimp Association, the training program for the disadvantaged came into being.

The Training Program

Training at the National Fisheries Training Center No. 1 began in February 1969. A second training center is being established at Tampa, Florida, for the Florida Shrimp Association.

Applicants for the training center are certified by the State Employment Service. They enter the course of instruction at the rate of 10 a week at 2-week intervals. The first phase consists of on-shore training at the training center site and dockside. This is followed by 44 weeks of on-the-job training aboard an assigned shrimp boat.

Instruction includes the history of shrimping, net work and net repair, trawls and rigging, handling the catch, piloting and navigation, communications and voice procedures, engine and machinery maintenance, seamanship, safety at sea, and life at sea. Audio-visual aids play an important part.

Because of the nature and background of the trainees, a considerable part of the training effort is devoted to social counseling to develop positive, success attitudes. Trained counselors of long experience are part of the instruction staff. When needed, remedial instruction in reading, writing, and arithmetic is conducted. Technical instruction is aimed at producing trainees who, when the on-shore phase is completed, will have attained the status of apprentice crewmen--and full-fledged rigman status when on-the-job training is completed.

Trainees are paid at the rate of $1.60/hr. for a 40-hour week at the training center and during the 44 week on-the-job-phase. They also share in the catch.

NAMES OF FISHES

Daniel M. Cohen

Commercial fishermen, the food processing industry, anglers, scientists, writers, Federal and State agencies, students and teachers and many others use names of fishes. Communication about these animals is impaired because some kinds of fishes have no names, others have more than one name, and some names are used for more than one kind of fish. The obvious solution would be for every species of fish to have one name that was universally recognized as referring to it alone. This article briefly discusses some of the causes of the confusion surrounding fish names.

Because they are essentially less complex, let us first consider scientific (Latin) names. The rules for the formation and use of scientific names are governed by the voluntary adherence of zoologists to the International Code of Zoological Nomenclature, most recently revised and published in 1964. In essence, the Code tells us that a zoologist who finds a species that lacks a scientific name may describe the species and give it a Latinized name (subject to certain rules and recommendations).

The name is composed of two parts. Let us take as an example the goldfish, Carassius auratus. Carassius is the generic name; one or more species may be included in the genus and will have Carassius as the first part of its scientific name. The second part, auratus, is the specific name and refers to only one species of Carassius. Both names together, Carassius auratus, make up the scientific name for the species that we recognize as the goldfish.

The starting point for scientific names is a book by the Swedish biologist Linnaeus, published in 1758. No scientific names published before that date are admitted to the system. If for any reason a zoologist gives a scientific name to a species that already has one, the name with the earliest date after 1758 takes precedence. If for any reason the same scientific name is given to two species, the last-named one must be given a new name. This system offers a relatively stable method of communication. Poisson rouge in French, chin-yü in Chinese, chrusoparon in Greek, aranyhal in Hungarian, kingyo in Japanese, zolotoi ribki in Russian, and dorado in Spanish are all different names for what we call the goldfish. Communication about goldfish is difficult without the universally recognized Latin name, Carassius auratus. It is a worldwide code word.

International currency notwithstanding, scientific names cannot replace common names for several reasons. Latin has no meaning for the average person; having two words in a name is cumbersome; and scientific names are subject to change, for as well as being a way of communicating they serve as a working tool of the scientist who classifies animals, and as classifications change scientific names may do likewise.

Common names serve a variety of purposes and arise in many ways. In fact, the only characteristic they share is that they are not Latin. To understand common names properly, we should consider the different kinds.

Local or folk names are the largest class of common names. They are deeply entrenched in the language of a region, and are often obviously descriptive, but sometimes their origins are lost in the past. They may present as much variation within a single language as do goldfish names between languages. An example is Micropterus salmoides, widely known as the largemouth black bass. In a study of the common names applied to the fishes of the bass and sunfish family, Smith in 1903 listed 53 different common names for this species. A few of them are: big-mouthed trout in Kentucky; chub and welshman in North Carolina and Virginia; cow bass and moss bass in Indiana; grass bass in Minnesota; gray bass in Michigan; green trout in Louisiana; marsh bass, bride perch and pointed tail in Ohio; and perch, trout and jumper throughout the South. Of course, many of these names have died out, but the fact that they once existed and were useful in communicating within a region illustrates what one writer (Macleod, 1956) described as ". . .colloquial names that have grown up spontaneously among ordinary people."

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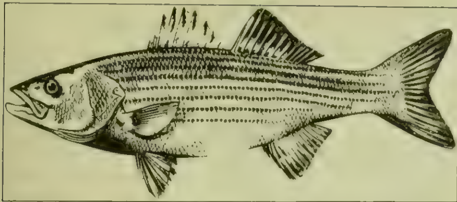

Fig. 1 - Morone saxatilis. Rockfish in Maryland, striped bass in California.

Another category of common names might be called coined or invented names. Many kinds of fishes are known to scientists alone and have only Latin names. If, in writing of one of these animals a common name is required, one is invented. The American Fisheries Society (1960) has listed all known kinds of fishes living in the United States and Canada to a depth of 100 fathoms. Some of the fishes on this list previously lacked any common name, and others shared a common name with one or more species. In order to insure a single common name for every species on the list, a number of names were invented. Another reason for inventing names is the importation into the United States of species from non-English speaking regions. The aquarium trade is the best example; a brief perusal of any authoritative book on aquarium fishes (for example, Sterba, 1967) will show many fishes from South America and Africa for which English language names have been invented. In a recent popular booklet on Californian deepsea fishes, Fitch and Lavenberg (1968) invented common names for species that previously lacked them. In some situations, scientists who describe a previously unknown species and give it a Latin name also invent a common name. This practice is very common in Japan.

Fig. 2 - Oncorhynchus tshawytscha. King salmon in California, chinook in Alaska.

The chief problem, however, lies with fishes that have too many names rather than with those that require invented ones. The commercial fishing industry, State and Federal agencies, and writers communicate about fishes chiefly by using common names. When a species has more than one common name, and there is a clear need for only one, it may be a major undertaking to decide which should be used. In some instances one of many local names is selected, in others an invented name is chosen. The basic reason for the choice of any name should be that it is understood by the widest audience.

In the Bureau of Commercial Fisheries publication 'Fishery Statistics of the United States' (Lyles, 1966) a glossary is presented, which lists scientific and common names, including for many species alternative common names. The names used are those with which the Bureau is best able to communicate with the various segments of the fishing industry.

The Food and Drug Administration is concerned with names of food fishes and deals with a set of names that might be termed semilegal. This agency is charged with maintaining standards of identity and its regulations require that labeling must not be false or misleading. In deciding what common names may be used by the food processing and distributing industries, they select (when such exists) a name that is common or usual from the viewpoint of the general public who use and purchase fish products. Allowable names are decided on a case-by-case basis.

Because they often write for a wide audience, sportswriters are another group requiring common names that do not vary regionally. The Outdoor Writers Association of America (1962) has attempted to promote stability by publishing a list of scientific and common names of principal American sportfishes. Although they hope their common names are widely accepted, they have annotated their list and presented many widely used alternative names.

The scientific community depends chiefly on The American Fisheries Society (1960) list of U.S. and Canadian fishes, a comprehensive and authoritative guide to scientific names; however, its common name section is of limited value because of inadequate coverage of alternative common names.

Users of common names have strong attachments to the familiar. Names of objects are so important to us that we tend to merge the name with the idea of the object. The idea of a piece of leather tied around the foot,

and the name of the piece of leather as a shoe, are virtually inseparable. Therefore, in addition to serving as a shorthand way of communicating, names become part of the total concept of an object. Consider, for example, an angler who associates the fish that scientists know as *Micropterus salmoides* with the name green trout. If he is served in thinking about *M. salmoides* or in communicating with others about it by the name green trout, and if the name largemouth bass has no meaning, then to him green trout is that kind of fish, official pronouncements notwithstanding.

If communication problems increase, the number of official lists of names may do likewise. When common names are required for legal reasons or other special purposes, a single name for each species is clearly desirable, and special lists will fill a real need in designating names that offer the best communication value for a particular purpose. A general list of fish names should serve a very different purpose. It may recommend a preferred name, but its chief function should be to report on and cross-index names that actually are used. The worth of any general list of names as an aid to communication and understanding is only as great as the scope of its coverage of alternative names and the basic documentation it presents. A general list should first of all tell its users whether names are invented or folk names. The source of invented names should be described and also the degree to which they are used--that is, whether they are found only in books or have entered the spoken language as well. Folk names should be presented by region and their degree of usage should also be indicated. A properly compiled and documented general list will present the basic information for the formation of useful special lists.

In summary, names of fishes are basically of two kinds, invented and folk names. Scientific names are invented and are usually, but not always, stable; however, they are not suitable for everyday use. Some common names are also invented and may be important, as for fishes imported from foreign language regions. Folk names may vary regionally. They originate in many ways and their usage is often deeply rooted. Various segments of the common-name-using public often use different names for the same species or the same name for different species. Because many common names have a high communication value and have also become part of the idea of the animal, it will probably be impossible for each species to have one common name that refers to that species alone. Users of common names for special purposes have attempted to list the names that serve them best. A well-documented general list, including alternative names, is needed.

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SHIPPING LIVE DUNGENESS CRABS BY AIR TO RETAIL MARKET

H. J. Barnett, R. W. Nelson, and P. J. Hunter

During shipments of live Dungeness crabs from Washington and California to distant retail markets, many crabs in each shipment die; frequently, all die. Reported here is a study made by BCF's Seattle Technological Laboratory to reduce these losses. As a result of this study, live Dungeness crabs can now be shipped by air, with a maximum loss of 5 percent, to any major city in the U.S.

Air shipment of live Dungeness crabs to retail markets was begun about 2 years ago by crab processors in California and Washington. The main outlet for the live crabs was in the Hawaiian Islands, where the shippers found a ready market. However, crabs in the early shipments suffered from high mortalities during transit and during holding after arrival. Frequently, the mortality was 100 percent.

In trying to solve this problem, the BCF Technology Laboratory in Seattle, Wash., began a cooperative study with a local shipper to improve the method of shipping.

RECOMMENDATIONS

The successful transportation of live Dungeness crabs by air requires proper handling before shipment, adequate packaging, and proper handling after shipment.

A. Handling Before Shipment

The methods presently used by the crab industry are not always conducive to marketing crabs in top-quality condition. The following steps are recommended to ensure that only crabs of highest quality are used for live shipments:

1. On the vessel, carefully remove the crabs from the pots and place them in a live well supplied with fresh, circulating seawater. Keep the injured and weak crabs separate from the uninjured and strong ones.

2. At the shore plant, carefully place the crabs in a live tank equipped to provide fresh, cool, flowing seawater. For best results, store the crabs in the holding tank at a ratio of no more than 2 lbs. of crab per square foot of storage area.

3. Keep the crabs in the holding tank for at least 24 hours prior to shipping. Promptly remove any injured or weak crabs. (During this holding period, the crabs do not need to be fed.)

4. Do not allow the crabs that are to be air shipped live to be held dry--that is, out of the water. (Although holding crabs out of water is common practice in preparing them for cooking, such practice is detrimental because it causes the gills to become dry. This causes the crabs to weaken and die relatively soon.)

B. Packaging for Shipment

Although great importance must be attached to the handling of crabs prior to shipment, even greater importance must be attached to procedures and materials used for packing live crabs. The critical factors are (1) the prevention of injury and (2) the control of temperature and humidity.

1. Prevention of Injury

Injury, which is caused by rough handling and improper packing, kills crabs. Tests have proved that losses are largely eliminated when crabs are properly handled and protected

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against damage. In laboratory experiments, various packing materials were evaluated for their ability to prevent injury. Materials tested included burlap, newsprints, wood shavings, seaweeds, and cellulose blankets. The most effective material was an embossed, crepe-cellulose, fiber blanket called Kimpack.1/ This material not only cushioned the crabs from shock but, when moistened, increased humidity in the container. It is easily stored and inexpensive. A half square yard of $\frac{1}{2}$-inch-thick Kimpak, for example, is enough to pack 50 pounds of crab in a Wet-Lok crab shipper and costs about 35 cents.

Banding claws to reduce injury, using methods developed for lobsters, was also tried. Banding proved awkward, time consuming, and not necessary.

2. Control of Temperature and Humidity

The control of temperature and humidity in packaged live crabs is of paramount importance. In laboratory tests, crabs were kept alive and in good condition for from 1 to 3 days under ideal conditions--at cool temperatures from 35° to 50° F., and at high relative humidities of 80 to 100 percent. When exposed to environments of temperatures above 50° F. and humidities below 70 percent, the crabs survived less than $\frac{1}{2}$ day.

Temperature and humidity during shipment can be controlled by using a suitable shipping container. The container must be insulated, leak-proof, light in weight, easy to handle, and reasonably strong. A strong container helps to protect the live crabs from external sources of damage.

At present, several containers on the market meet most or all the requirements. These containers are variously constructed of foamed polystyrene liners supported by corrugated fiberboard master cartons, or by waxed and resin-impregnated fiberboard insulated with waxed (exterior) double-corrugated fiberboard.

The foamed polystyrene containers are suitable for shipping live crabs and are used extensively for shipping live lobsters. These containers cost 2 or more dollars each in quantity lots. However, a cheaper foamed plastic container, developed by BCF's Gloucester (Mass.) Technology Laboratory, was recently introduced. Good results were obtained when the BCF container was used in shipping live crabs. It costs about $1.50 each in quantity lots.

Most of our experiments were made using a modified insulated Wet-Lok container (wax and resin-impregnated fiberboard) designed by us in cooperation with a local paper company. The insulated Wet-Lok has the characteristics necessary for safe shipment of live crabs and is relatively inexpensive. This fiberboard container costs about 90 cents each when bought in quantity.

In addition to adequate packing materials and shipping containers, a suitable refrigerant also is needed. One of the best approaches to refrigerating live crabs during shipment is to use gel-ice (sometimes called Zero Pack or Reusable Ice1/). Gel-ice, besides being a good refrigerant, is not liquid at temperatures above the melting point of ice, and it is nontoxic. In quantity lots, a 3-pound pack costs about 10 cents a pound.

Based on laboratory and commercial results, BCF's Technology Laboratory at Seattle recommends the following procedures for handling and air shipping live Dungeness crabs:

1. Select an insulated and leakproof container capable of holding about 50 pounds of crab.

2. Place about 12 pounds of frozen gel-ice (the 3-pound pack version) or its equivalent in the bottom of the container.

3. Cover the gel-ice with a single pad of moist material, such as Kimpak, and prechill the container and packing material at 0° F., or colder, for at least an hour (Figure 1).

4. After carefully prechilling the container, load it with live crabs (Figure 2).

5. Layer the crabs (Figure 3) in the container. Separate the layers with a single pad of moist material, such as Kimpak. Cover the top layer of crabs with a single moist pad. Depending on size and weight of crabs, do not pack container with more than 20 to 25 live crabs, or about 50 pounds.

6. Place the top of the container in position (Figure 4), and secure the container and top with double strapping. Mark container appropriately--for example, "Live Crabs," "Keep in Cool Place," "This Side Up," "Do Not Freeze."

7. Ship the crabs as soon as possible after they are packaged.

1/Trade names mentioned do not imply endorsement but are used only to simplify descriptions.

8. Notify forwarding agent that live crabs are being shipped so extra care can be given during shipment.

Crabs so packed will survive out of water for 25 to 30 hours at ambient temperatures--from 65^{o} to 75^{o} F.

Fig. 1 - Modified Wet-Lok crab shipper prepared with gel-ice and moist Kimpak prior to prechilling.

Fig. 2 - Loading live crabs into the shipper.

Fig. 3 - Layering live crabs in the shipper.

Fig. 4 - Placing container top into position prior to strapping.

C. Handling After Shipment

On arrival, the crabs should be examined immediately. Weak crabs should be removed and processed immediately--cooked. The remaining crabs should be placed in a seawater live tank; the water should be circulated at a rate of 10 to 15 gallons per minute and refrigerated at 40° to 50° F. If natural seawater is not available, synthetic seawater can be substituted. (Synthetic seawater salts are available from commercial sources.) If the crabs are displayed in a closed system, such as a lobster-display tank, the water must be filtered. Although glass-wool filters are commonly used in display tanks, we recommend sand filters.

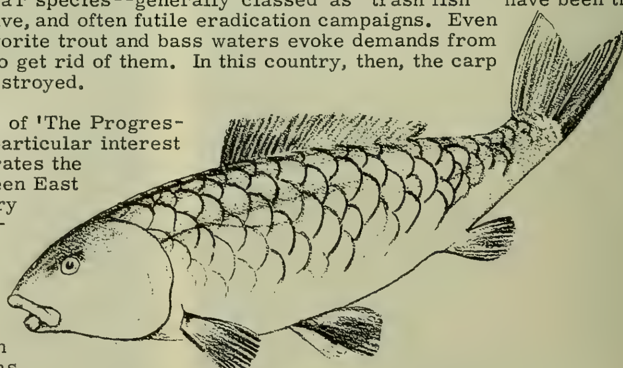
MARKET POTENTIAL

The market for live Dungeness crabs is substantial. Since crabs were introduced to the Hawaiian Islands about 2 years ago, sales have more than doubled. The potential market in the Midwest and East also appears good. Test and commercial shipments of live Dungeness crabs into these areas indicate demand for this type of product would be more than several million pounds a year.

While the Dungeness crab industry is trying to expand its markets through diversification of its product and increased advertising, marketing these crabs alive apparently would fit into the picture readily. If developed in the same manner that the live-lobster industry was, the live-crab industry should be successful.

A DIFFERENCE IN PHILOSOPHY

The introduction of carp into North America during the late 1800's is viewed by most anglers and fishery managers as a mistake of gigantic proportions. During the intervening years, carp and similar species--generally classed as "trash fish"--have been the objects of extensive, expensive, and often futile eradication campaigns. Even small numbers of carp in favorite trout and bass waters evoke demands from anglers to "do something" to get rid of them. In this country, then, the carp is damned, despised, and destroyed.



A brief note in an issue of 'The Progressive Fish Culturist' is of particular interest since it dramatically illustrates the differences in outlook between East and West. In India, a country badly in need of animal protein, fishery workers were having problems--as they seem to have all over the world. Mosquito-fish, the same species so popular in the United States for use in mosquito control programs, were seriously interfering with the production of one of their favorite food fish. Consequently, a chemical control program was instituted to rid their waters of these pests. The program was successful and soon their waters teemed with the favored species. This species was, of course, carp. ('Outdoor California,' Department of Fish and Game, Sacramento, California.)

DEMERSAL FISHES

"Demersal Fish Resources: Composition, Distribution, and Commercial Potential of the Continental Shelf Stocks off Southeastern United States," by Paul Struhsaker, 'Fishery Industrial Research,' Vol. 4, No. 7, Fish & Wildlife Service, Department of the Interior, 1969, pp. 261-300, illus. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

The Bureau of Commercial Fisheries and other agencies have been exploring the waters bordering the southeastern U.S. since 1950. The exploratory fishing vessel 'Silver Bay' conducted trawling explorations for offshore demersal fishes in this area from 1959 to 1964. This report summarizes and evaluates the results.

The primary purpose of the explorations was to determine the commercial potential of the offshore demersal stocks. There were two other aims--to find offshore concentrations of species that could be used immediately by the fishing industry, and to obtain a picture of the distribution and availability of demersal fish stocks as they are related to the general features of the shelf environment.

The most productive grounds were found off northeastern Florida and South Carolina, although isolated productive areas occurred along most of the southeastern coast. Mr. Struhsaker reports that moderate-to-large catches of snappers, groupers, porgies, and ecologically associated species can be consistently made with roller-rigged New England-type fish trawls. He estimates, conservatively, that proper use of the resources could at least double the present annual landings of snappers and groupers in the area.

The report includes a fishing log and chart of 50 stations, where catches of commercial size were made, and a list of demersal fishes taken during the exploration, with notations on their occurrences in the trawl catches.

DOLPHINS

"The Dolphin, Cousin to Man," by Robert Stenuit, Sterling Publishing Co., New York, 1968, xv + 176 pp., illus.

Robert Stenuit, oceanographer, world-famous diver and author, has been deeply interested in dolphins since his first contact with them in 1964. In this fascinating introduction to the study of dolphins, he discusses all aspects--biology, intelligence, domesticability--and their future as active partners with man in exploitation of the sea.

FRESHWATER FISH

"Methods for Assessment of Fish Production in Fresh Waters," International Biological Program Handbook No. 3, edited by W. E. Ricker, Blackwell Scientific Publications, Oxford & Edinburgh, 1968, 313 pp., illus.

This is a companion volume to the "Biological Basis of Freshwater Fish Production" (CFR, Dec. 1968). It is aimed at biologists who have basic university training in zoology and some knowledge of ecology and freshwater biology, but with no special experience in research on fish. With the aid of this handbook, such biologists will be able to carry out worthwhile and rewarding research in fish production in any part of the world.

FISH 'VOICES'

"An Atlas of Fish Sounds," edited by B.P. Manteifel (in serial report 'Translations of USSR Resources No. 3'), JPRS Trans. No. 47.707, 46 pp., $3. Available from Clearinghouse, U.S. Department of Commerce, Springfield, Va. 22151.

Published in the USSR in 1968, this atlas contains data on the characteristics of the 'voices' of 79 species of cartilaginous and bony fishes, mostly marine. It includes sounds of feeding, maneuvering of schools, threat, and others. It gives the taxonomic

position of the fishes and describes the biological significance and physical characteristics of fish sound. The original Soviet publication included sound graphs and a phono disc with recording illustrating 'vocal' abilities of certain species, but these are not included with the translation.

FISH FINDING

"Fish Location by Hydroacoustic Devices," by V.G. Azhazha and E.V. Shishkova, Pishchepromizdat, Moscow, 1960. Translation No. TT 67-51265, 1968, 113 pp., illus. U.S. Department of Commerce, Clearinghouse, Springfield, Va. 22151.

Sonar is an apparatus that detects the presence and location of a submerged object by means of sonic and supersonic waves reflected back to it from the object. It is widely used for measuring the depth of the sea and locating coasts, ships, and shoals of fish.

This is a Soviet textbook on the use of hydroacoustic instruments on scouting and fishing vessels. It explains the physical principles of fish finding, sonar computations, and the practical aspects of using hydroacoustic equipment. The Soviet-made NEL 5r is described in detail because it incorporates all the elements typical of other types of echo sounders.

FISH HOLDS

"Care of Fish Holds," by Wayne I. Tretsven, 'Fishery Industrial Research,' Vol. 4, No. 6, 1969, Fish & Wildlife Service, Department of the Interior, Washington, D.C. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

Holds in fishing vessels have long been a problem. Difficult or impossible to clean, they are often the cause of unnecessary spoilage of fish. Mr. Tretsven suggests methods of cleaning and sanitizing the hold, and applying a preservative to wooden holds. He recommends an approved fungicide for treatment of wood in the holds. Reporting on the effectiveness of lining the hold with polyethylene sheeting, he concludes that it is a practical method for keeping fish and ice from contact with the hold, and for keeping the hold clean and dry.

MARKETING

"Report on Market for Frozen Fish in the U.S.," by Dag Halland and Stig Valland, 1968, Translation No. PB 182 816 T, 94 pp., $3, (microfiche 65¢). U.S. Department of Commerce, Clearinghouse, Springfield, Va. 22151.

This is a report on the results of a research project conducted in the U.S. for 3 months during the summer of 1968. Halland and Valland give their views of the U.S. marketing system, the structure of the European fishing industry, centralized versus decentralized exports, and the most profitable alternatives. Concluding that present conditions on the U.S. market are unfavorable to Norwegian frozen fish exporters, they suggest that better marketing techniques should give Norway a bigger share of this market. Her present share is only 10%.

PROCESSING

"Rapid Method for the Estimation of EDTA (Ethylenediaminetetraacetic acid) in Fish Flesh and Crab Meat," by Herman S. Groninger and Kenneth R. Brandt, 'Fishery Industrial Research,' Vol. 4, No. 6, 1969, Fish & Wildlife Service, Dept. of the Interior, Washington, D.C. Available from Division of Publications, 1801 N. Moore St., Arlington, Va. 22209.

EDTA has been reported useful, or potentially useful, as an additive to seafoods to stabilize color, retard the formation of struvite, inhibit enzyme-catalyzed changes in flavor, and to inhibit the growth of bacteria. Since EDTA often is applied by spraying or dipping the seafood, the amount of EDTA actually added must be determined by a suitable quantitative method.

This paper describes a simple and rapid method giving about 90% recovery of added EDTA from fish flesh and crab meat.

MARINE CORROSION

"Marine Corrosion," by T. Howard Rogers, George Newnes Ltd., London, 1968, 307 pp., illus.

Corrosion is an insidious consumer of our stocks of raw materials, a squanderer of our productive capacity, and a dissipator of the fruits of our labors.

The systematic study of the corrosion of metals stems only from the end of the first World War. Despite the great technological advances since then, there is still no cheap construction steel alloy with any better corrosion resistance to sea water than was available 100 years ago.

There is a large volume of corrosion literature, but it is distributed over a wide range of scientific and trade journals. Mr. Rogers has attempted to cover the corrosion problems of the marine and ship building industries in a single volume.

OCEANOGRAPHY

"The Waters of the Sea," by P. Groen, D. Van Nostrand, Princeton, N.J., xiv + 328 pp., illus.

This is a book about the sea, with particular reference to its physics. A highly readable and descriptive work, it is intended primarily for students of geography, marine geology, marine biology, and students in nautical schools. It covers exploration of the oceans, water of the sea, sea ice, waves, ebb and flow ocean currents, and energy exchange in the oceans.

OYSTERS (TECHNOLOGY)

"Opening Oysters and Other Bivalves Using Microwave Energy," by Joseph M. Mendelsohn, et. al. 'Fishery Industrial Research,' Vol. 4, No. 7, Fish & Wildlife Service, Department of the Interior, Washington, D.C., pp. 241-248, illus. Available from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209.

Opening the shells of oysters and of other bivalves is difficult, time-consuming, and potentially dangerous. The rate of production of an inexperienced shucker is so low that he cannot earn the wages he must receive under minimum wage laws. This paper discusses the microwave process, and concludes that it is more efficient and less expensive than shucking by hand.

STURGEON

"Age, Growth, Food, and Yield of the White Sturgeon (Acipenser transmontanus) of the Fraser River, British Columbia," by S. N. Semakula and P. A. Larkin, article, 'Journal of the Fisheries Research Board of Canada,' Vol. 25, No. 12, 1968, pp. 2589-2602, illus.

The Fraser River white sturgeon fishery rose from 80,000 pounds in 1880 to a peak of 1 million pounds in 1897. Despite regulations dating from 1911, catches have declined steadily. Since 1918, commercial catch has ranged from 10-50,000 pounds annually. The sport fishery might take an additional 20-30,000 pounds a year.

This report concludes that a sustained yield of about 25% more than the present catch is possible; also, a trial fishery for 2 or 3 years, taking about 100,000 pounds per year, may be warranted.

TESTING EQUIPMENT

"An Improved Fish Measuring Board," by C. W. Woods, Publication No. 125, Fisheries Research Division, Marine Department, Wellington, N. Z. Reprinted from 'N. Z. Jl. mar. Freshwat. Res.', Vol. 2, No. 4, pp. 678-83, illus.

Measurements of fish length are subject to many forms of error; one is number bias. This may be unimportant if the measurements are made to a greater accuracy than is required for analysis, but it can waste time. C. W. Woods describes a fish-measuring board that permits rapid and easy length measurement to be made without a number bias.

TUNA

"Tuna Distribution & Migration," by Hiroshi Nakamura, Fishing News (Books) Ltd., London, 1969, 76 pp., illus.

Water temperature has long been considered a primary factor in controlling fish distribution. On the basis of data on occurrence, size composition, spawning, feeding, etc., of tunas, Nakamura published a set of hypotheses on the distribution and migrations of tunal in relation to ocean currents in 1954. This book revises his hypotheses in the light of information obtained since then. All the results of his investigations seem to support his opinion that "an area covered by a certain ocean current is a distinct habitat of tunas, a discrete ecological sphere."

SALES PROMOTION

"The Nautical Way," Book Department, Institutions Magazine, Chicago, 1969, 104 pp., illus., $3.95.

This book is a sales-promotion effort for fish and seafood. It includes information on food service operations, equipment, products and purchasing, preparation recommendations, merchandising ideas, and 100 fish and seafood recipes.

TURTLES

"On the Coast of Tamaulipas," by Humberto Chavez, Martin Contreras G., and T. P. Eduardo Hernandez D., reprinted from 'International Turtle & Tortoise Society Journal,' Vol. 2, Nos. 4 & 5, 1968, 21 pp., illus.

The region of Rancho Nuevo, Tamaulipas, is the only important nesting zone of the ridley turtle, *Lepidochelys kempi* (Garman) in its entire geographic distribution. Sale of its eggs is forbidden by Mexican law. However, in 1963, it was estimated conservatively that 80 to 90% of the nests were destroyed by men on the day of their construction.

An arrival of 40,000 specimens was recorded in 1947. But by 1966 the largest arrival observed had less than 2,000 turtles. A program to study their biology, and to develop a plan to protect them, was initiated by the Mexican government in 1966. This is a report on a $3\frac{1}{2}$-month study made in 1966. It includes a description of the turtle's nesting and biology.

VANISHING SPECIES

"The Canterbury Mudfish, *Galaxias burrowsius* Phillips, A Vanishing Species," by W. Skrzynski, Publication No. 122, Fisheries Research Division, Marine Dept., Wellington, N. Z. Reprinted from 'N. Z. Jl. mar. & Freshwat. Res.', Vol. 2, No. 4. Dec. 1968, pp. 688-87, illus.

Galaxias burrowsius is able to survive out of water in damp earth for long periods. It can be assumed that it occupies isolated waters that dry periodically, and where it probably has no competition from other fish. Such waters, once common on the Canterbury Plains, have been almost eliminated by draining or connection to rivers and artificial channels. Mr. Skrzynski, believing it unlikely that *G. burrowsius* will continue to survive, has summarized all available information on it in this paper.

WHALES

"The Whale," Simon & Schuster, New York, 1968, 287 pp., illus., $20.

This is a beautiful book; it contains 267 illustrations, 87 in full color, including drawings, paintings, ancient woodcuts, old whaling prints, and photographs of contemporary whaling operations. But it is far more than a book to look at. It tells the myths and stories of whales throughout history. It includes a complete natural history of every species of whale and dolphin. And it provides a detailed history and description of whaling from earliest times to the present. A most complete and definitive review of a fascinating creature.

The main author and supervising editor is the former director of the Zoological Society of London, Dr. Leonard Harrison Matthews, F.R.S. Scientists from the important whaling countries have helped to make the book a product of complete international cooperation.

--Barbara Lundy

INTERNATIONAL

Tuna Treaty Comes Into Force

An international treaty aimed at scientific management of heavily fished tuna stocks in the Atlantic entered into force on March 21, 1969, when Spain became the seventh nation to ratify it.

The International Convention for the Conservation of Atlantic Tunas was drafted in Rio de Janeiro, Brazil, in May 1966, under auspices of the Food and Agriculture Organization (FAO) of the United Nations. Six countries had previously been parties to it: U.S., Japan, Ghana, Republic of South Africa, France, and Canada. With the seventh, Spain, the Convention automatically took effect.

The Convention provides for setting up an international commission to recommend scientific management of tuna fishing in the Atlantic to protect and preserve the stocks.

Decreasing Catches

Fishing for tuna in the Atlantic Ocean has increased greatly in recent years. Despite the increase, catches have not risen appreciably. Yellowfin catches have actually declined--from an estimated 68,000 metric tons in 1964 to 60,000 in 1966. At an FAO meeting in Miami, Florida, in 1968, experts warned that tuna stocks, while on the whole plentiful, needed supervision to prevent overfishing. (FAO, Mar. 22, 1969.)

FAO Publishes Guide on National Coastal Waters

How far do the territorial waters of nations extend out to sea? A survey shows claims ranging from 3 to 12 miles for most nations and up to 200 for some.

The survey, first of its kind, was prepared by FAO and covers 102 coastal nations (excluding Mainland China). It includes information on exclusive fishing zones, fishery conservation zones, and claims regarding continental-shelf exploitation.

3, 12, 200 Miles

The survey shows 28 nations have a 3-mile limit. These include France, Japan, the United Kingdom, and the U.S.

Thirty-one others, including the USSR, claim 12 miles.

At least 6 countries--including Argentina, Costa Rica, Ecuador, El Salvador, Panama, and Peru--claim a full 200-mile territorial sea or exclusive fishing zone.

About 40 countries with a narrow territorial sea also claim exclusive fishing zones beyond this area, usually up to 12 miles from the coast.

International Conventions

The survey also lists the parties to the 1958 Convention on the Territorial Sea and Contiguous Zone, the 1958 Convention of the Continental Shelf, and the signatories of the 1964 European Fishery Convention. The latter, not yet in force, was the first multilateral agreement recognizing a maximum 6-nautical-mile limit for the territorial sea, and a further 6-nautical-mile maximum exclusive fishing zone.

The document was prepared by FAO as guide to the status of national coastal waters, principally for fishery purposes. It does not express opinion on national claims. (FAO, Mar. 14.)

Japan & USSR Open NW Pacific Fisheries Meeting

The Japan-USSR Northwest Pacific Fisheries Commission met in Tokyo on April 2. It discussed salmon, herring, and other fish catches in the northwest Pacific. The Tokyo talks were delayed over a month by the drawn-out king crab negotiations in Moscow. Japan feared the discussions would not be ended by April 30, when the Japanese salmon fleet normally departs for Area B (south of 45° N. latitude).

Since 1969 is a dominant year for Asian pink salmon, a major point of the talks was whether the USSR would agree to set this year's Japanese salmon catch quota at or above 108,000 metric tons. That was the quantity allotted to Japan in the previous good pink year of 1967.

1968 Salmon Catch Data

On March 31, the Japanese Fisheries Agency released data on the 1968 salmon catches of both countries. The Soviet catch, 40,177 tons, fell about one-third short of the target. The Japanese catch in Area A (north of 45° N. latitude) just reached the quota of 46,500 tons, but in Area B it fell about 900 tons below assigned quota. The short catch was attributed to an abnormal occurrence of plankton, causing poor bait biting in the long-line fishery. ('Suisan Tsushin,' Apr. 2.)

Japan-USSR Salmon Catches, 1966-68

	1968	1967	1966
	..... (Metric Tons)		
Japan			
Area A:			
Catch quota	46,500	52,500	48,000
Actual catch:	46,365	52,333	47,782
Mothership fishery . .	37,642	42,544	38,930
Drift gill-net fishery .	8,723	9,789	8,852
Area B:			
Catch quota	46,500	55,500	48,000
Actual catch:	45,647	62,540	53,395
Drift gill-net fishery .	30,867	41,883	32,251
Long-line " .	7,779	16,958	14,678
Japan Sea gill-net fishery	3,493	3,699	3,015
Small-vessel gill-net fishery	3,508	-	3,451
Coastal trap fishery . . .	2/11,098	2/13,581	22,145
Total1/	103,110	128,454	123,322
USSR			
Planned catch	60,000	83,000	65,000
Actual catch	40,177	78,000	56,223

1/Total area A & B actual catch & coastal trap fishery catch.
2/Jan.-Sept. catch.

Italian-Ivory Coast Tuna Company Formed

A joint Italian-Ivory Coast company is planning to fish tuna out of Abidjan. It will have 6 tuna seiners with freezing capacity for at least 350 tons of raw tuna. The vessels will be built in Italy from French designs based on U.S.-type vessels. They will be able to fish for sardines as well. Each will be about 145 feet long with 1,800 hp. The vessels will be managed by the Société Ivoirienne de Pêche et d'Armement (SIPAR).

European Market

Tuna landed from the new company's vessels will be shipped to Italy, either frozen or canned. Tuna also may be shipped to other members of the European Common Market.

Norwegian Firm Opens Sales Center in Czechoslovakia

Frionor (Norsk Frossenfisk A/L), a Norwegian firm has opened a sales center in Prague. The 1,500-square-foot center includes a self-service shop for fish products, a fish demonstration section, and a snack bar. The technical equipment, including freezers, is Norwegian. The center, to be operated by Czechoslovakians, represents an investment of US$280,000. One-sixth of the money came from a Norwegian Government fund to promote fishery exports.

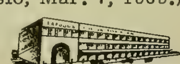
Czechoslovakia A Major Market

Czechoslovakia is a major market for Norway's frozen fish fillets. Frionor has exclusive right to export Norwegian frozen fish fillets to Eastern Europe. It currently sells 5,000 metric tons of frozen saithe fillets, and 1,500 tons of other fish fillets to Czechoslovakia annually.

To Promote More
Highly Processed Products

Besides promoting sales of frozen fish fillets, the center hopes to develop Czechoslovak tastes for more highly processed products. Current exports are mainly standard packs, but Frionor plans to increase the supply of consumer packed frozen fish fillets under its own brand name.

Frionor sales centers are supposedly being planned for Moscow and Budapest. (U.S. Embassy, Oslo, Mar. 7, 1969.)



Canada Seizes Japanese Fishing Vessel

On Feb. 25, 1969, a Canadian patrol boat seized the Japanese fishing vessel 'Kotoshiro Maru' (480 gross tons) within 12 miles off British Columbia. Canadian authorities reportedly will prosecute the captain and 31 crewmen on charges of violating Canada's 12-mile exclusive fishery zone. This is the first time Canada has seized a Japanese fishing vessel. ('Minato Shimbun,' Mar. 1.)

Japan-USSR Crab Talks End

The Japan-USSR crab negotiations held in Moscow since Feb. 6, 1969, were concluded on April 11, with the signing of a one-year agreement.

Japan's 1969 quota of king crab and tanner crab in the northwest Pacific is about 20% and 26% less, respectively, than actual 1968 production. In the Okhotsk Sea, off western Kamchatka, Japan's king crab quota is 216,000 cases.

Japan is reported to have accepted the Soviet demand for a complete ban on fishing of blue crab (a king crab) off Cape Olyutorski. In 1968 Japan operated one fleet, producing 48,000 cases. Japan also accepted a ban on tanner crab fishing off the Maritime Province of Siberia. Twelve Japanese fleets harvested 3.6 million tanner crabs in 1968.

Soviet negotiators had contended that the crabs are Soviet Continental Shelf resources, but after considerable argument with the Japanese, the matter was set aside. ('Kanzume Nippo,' Apr. 5 & 14.)

Japan Considers 12-Mile Fishing Zone

The Japanese Government, spurred by Soviet mackerel fishing off Japan, is studying establishment of a 12-mile exclusive fishery zone. However, the Government may not readily reach a decision since Japan stands to lose more than she would gain. Adoption of a 12-mile limit would affect adversely Japan's distant-water tuna and trawl operators. Their operations in the 12-mile zones of foreign countries yield an annual production worth about US$55.6 million.

Japan also would find herself unable to oppose extension of sea limits by other countries. She would no longer be able to ignore the legal questions of jurisdictional rights over resources in negotiating agreements with foreign countries.

Government's Dilemma

There is a large difference between 3 and 12 miles in the tuna fishery, especially off the Pacific islands and in distant-water trawling. Japanese vessels cannot operate profitably in the eastern Bering Sea and the Atlantic unless they are allowed to fish within the 12-mile zones of other countries.

The problem is that more nations are tending to recognize a 12-mile jurisdiction. Pressure is also building among Japanese coastal fishermen, lawmakers, and news media to widen the fishery limit. ('Suisan Tsushin,' Mar. 20.)

Soviet Vessel Finds Commercial Shrimp Quantities Off Tunisia

Significant commercial quantities of shrimp were discovered in the Gulf of Gabes off Tunisia's east coast. They were discovered during a FAO study cruise by the Soviet research vessel 'Akademik Knipovich' in the Mediterranean from Nov. 3 to Dec. 1, 1968. The largest catch per hour of trawling was 154 lbs., compared to an average of 44-55 lbs. in the Gulf of Mexico. FAO scientists believe the resource is large enough to make commercial shrimp trawling with small vessels profitable.

Some concentrations of sardines were found. Reasonably good catches of shrimp were made in depths of more than 100 meters (50 fathoms) on the Algerian Continental Shelf.

The Tunisian and Algerian governments will be provided with data collected during the cruise. FAO believes the information may be important to the fishing industries of both countries.

Underwater Fish Tagging

A cruise highlight was an undersea demonstration in fish-tagging techniques by Erdogan F. Akyüz, FAO marine biologist from Turkey. Akyüz dived to 100 feet off Tunisia to tag fish held in the trawl. Colored plastic identification markers were inserted into the fish to trace their growth, migration patterns, and behavior. The tagged fish were kept in a large metal cage to see whether the tagging had been successful and to evaluate the usefulness of various tags.

The tagging demonstration showed that fishery studies and research can be moved from laboratories into the sea.

Joint USSR-FAO Project

The cruise was organized by FAO and the USSR under the United Nations Development Program (UNDP). Its purpose was to provide instruction and training in fishery and marine science techniques to personnel from countries interested in expanding and modernizing their fisheries. Although the Soviet Union is not a member of FAO, it cooperates in various FAO/UNDP projects.

Trainees from 9 Countries

Fifteen trainees from Algeria, Ethiopia, Indonesia, Philippines, Romania, Syria, Sudan, Tunisia, and Turkey participated in the study cruise. Their work was guided by Soviet and FAO scientists and technicians, who conducted lectures and practical demonstrations in marine biology and oceanography.

Following the cruise, which began in Tunis and ended in Naples, trainees and Soviet officials visited FAO headquarters in Rome. ('Fishing News International,' Jan. 1969.)

FAO Says World Will Need 100 Million Tons of Fish by 1985

The world's need for fish is expected to rise from about 60 million tons to 100 million tons by 1985, FAO says.

The estimated increase is part of a study of future world food needs by the Indicative World Plan for Agricultural Development being prepared by FAO. The study's fishery aspects were discussed in April 1969 by the FAO Committee on Fisheries at FAO headquarters in Rome.

Projects World Demand

The study findings are not final. The study starts from a 1962 base and assumes a predictable rate of increase in demand. It projects world demand for fish and fishery products at 70 million tons in 1975--and about 100 million tons in 1985. About one-third of this demand would be for fishmeal for feeding animals.

At the same time, the estimated potential of species fished now in marine and inland waters was estimated at 140 million tons. This excludes krill, lantern fish, and other small fishes that people do not eat; if these species were included, the potential harvest would be raised to 200 million tons or more.

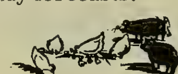
The greatest proportionate increase in demand is expected from the developing countries. However, the greatest increase in fishing effort seems likely to be made by developed countries, such as Spain, the Republic of South Africa, and the Soviet Union.

Uneven World Fishery Output

The study notes that world fishery production has been increasing at a faster rate than population growth. But it has been an uneven increase--in species caught and geographical distribution. "Much of the rise was not used for human food."

Members of the 34-nation committee agreed that the increased demand, especially for species now fished, called for international surveys and measures to manage fish stocks. The committee recommended further study after delegates emphasized the need for more precise estimates of consumption and demand.

Dr. William M. Chapman of the U.S. predicted that technological advances and expanded world trade in fishery products would push production and demand even higher than the FAO study forecasts.



FAO Official Warns of Dumping Chemical Wastes into Sea

Marine pollution is being aggravated by new forms of contamination. One is the long-discharge pipe used to dump chemical wastes into the sea, says Dr. Sidney I. Holt of FAO's Department of Fisheries. There is an "increasing tendency to deliberately discharge wastes at considerable distances from shore through pipes extending into the sea instead of using ships for the purpose."

Dr. Holt adds that some pipelines extend many miles from shore and carry industrial and municipal wastes harmful to fish and other marine life. There are no international regulations to register or control this dumping. However, Dr. Holt points out, most dumping is done from ships. He notes the growing danger of accidental pollution from bulk transport of toxic substances.

FAO Committee Meets

Dr. Holt spoke recently before the 34-nation FAO Committee on Fisheries during debate on marine pollution problems and the international action necessary to prevent future 'Torrey Canyon' disasters.

Poland and Finland reported to the Committee that pollution in the Baltic Sea continues to worsen because of industrial wastes and the shallowness of coastal waters. The Baltic's pollution is the subject of an international study expected to be published in October 1969 by the International Council for Exploration of the Sea.

Spain complained about the continued dumping of radioactive wastes in the Iberian trench 200 miles off Spain and Portugal.

Nigeria warned of the effect on fisheries of shock waves from underwater detonations in oil explorations on continental shelves.

Tanzania expressed fear of pollution from oil tankers too large to navigate the Suez Canal. At present, she has no coastal pollution problem.

Other African countries expressed concern that industrialization might make their continent the newest area of marine pollution.

The United Kingdom noted that new forms of pollution occur all the time, including run-off of pesticides from the land.

Dr. Holt concluded that the variety of pollutants is "increasing almost faster than our ability to get information on them."

In late 1970, FAO will hold an International Conference on Marine Pollution and its Effects on Fisheries.

Peru Offers Aid to Developing Countries

A leading Peruvian fishery industrialist has promised that Peru, the world's largest producer of fish meal, will assist Asian and African developing countries to establish fish-meal industries.

L. Banchero Rossi, president of Peru's National Association of Fisheries, told an FAO subcommittee that Peru would be "delighted" to offer its experience in fish-meal production to countries bordering the Indian Ocean.

Indian Ocean Resources

Banchero spoke during a debate on proposals to promote development of the vast resources of the Indian Ocean. The possibility of increasing its yearly fish catch from about 2.2 million metric tons a year--about 1/20th the world marine catch--is being studied by the FAO Indian Ocean Fishery Commission.

Banchero said that his country could train personnel from Asia and Africa in fish meal factories in Peru. Efforts would be coordinated through FAO. ('Fishing News International,' Mar.)

FOREIGN

CANADA

PROPOSALS TO ASSIST FISHING INDUSTRY

Canadian Fisheries Minister Jack Davis said in House of Commons, Feb. 20, 1969, that the groundfish industry is in trouble because export prices for frozen groundfish products have declined sharply since 1967. He noted that the industry sells close to 90% of its output in the U.S., and that the Canadian government must reinforce the industry's position abroad to improve the marketing outlook permanently. The proposed assistance to the Canadian commercial fisheries consists of:

1. Government purchase of frozen groundfish products to strengthen and stabilize the market. Accumulated supplies eventually will be sold through ordinary commercial channels, but not at prices lower than those paid for them. Nor will they be sold until the export price is high enough to cover basic costs of production, including an adequate price to fishermen. Close to 15,000 fishermen, plant workers, and their families depend on the groundfish fishery. The government hopes to hold fishermen's prices at a level no lower than the 1965-67 average.

2. Emergency loans to fishing and processing firms in 1969 for working capital and industry restructuring. Repayment will be waived until the market price of principal groundfish products reaches a level that will ensure adequate returns.

3. Mid-term and long-term measures are also contemplated because important economies may be achieved soon both at sea and in processing plants. The groundfish industry will be encouraged to get financial assistance under the Canadian General Adjustment Assistance Program. Under this program, assistance is available to any firms prepared to restructure operations to improve its competitive position, between now and the early 1970's.

* * *

FAVORABLE REACTION TO GROUNDFISH PURCHASE PLAN

General industry reaction to the proposed new groundfish purchase plan is favorable, although Nova Scotia fish producers are not sure whether it includes all groundfish, or just some of more beleaguered species such as cod. No additional details have been announced since the plan was proposed in the House of Commons on Feb. 20. It is believed, however, that the overall cost would be more than the C$4 million deficiency payments of last year.

Adequate storage space exists for any government purchases that may be made. There is some risk that the government eventually might be forced to dispose of some purchases for fish meal or other low-return products, thereby taking a loss.

Program's Goal

The goal of the program is to make sure exvessel prices do not fall below 1965-67 levels. Canadian newspapers speculate that the government will pay a few cents above the current average production price of 26 cents a lb. for cod--6-7 cents a lb. more than the industry now gets on the U.S. market. Larger producers are particularly pleased with the new program because they own the warehouses in which government-purchased fish must be stored. (U.S. Consul, Halifax, Feb. 26, 1969; U.S. Consul, St. John's, Mar. 3, 1969.)

* * *

INTERNATIONAL COOPERATION ON GROUNDFISH MARKETING

A major Canadian move to assist the deflated world markets for groundfish has brought promises of cooperation from Denmark, Iceland, and Norway.

Canadian Fisheries Minister Jack Davis said: "I am delighted to hear that the Nordic countries, who are our chief competition in the groundfish field, have endorsed our programme of price stability for the frozen

Canada (Contd.):

groundfish industry. The programme, instigated here, puts the Government, through its Fisheries Support legislation in the Canadian market itself and was designed to raise fish prices by holding back supplies until the market adjusted itself upward.

The participating nations agreed to watch the trends on world markets under review and to meet again later this year. (Canadian Fisheries Ministry, Mar. 5,1969.)

* * *

DOGFISH CANNED SUCCESSFULLY

A Canadian has claimed success in canning dogfish. He reports it tastes like black cod. Dogfish had defied canning before because of its high ammonia content.

Armand St. Jean of Nanaimo, who worked on this project for 3 years, intends to open a C$200,000 complex employing 50 people to can and market the product. ('Canadian Fisherman,' Mar. 1969.)

* * *

STRENGTHENS LOBSTER LICENSING PROGRAM

Four new regulations have been added to the lobster licensing program for the waters off Nova Scotia, New Brunswick, and Prince Edward Island:

(1) Minimum trap limits are being established to define the lower limit of commercial fishing operations in all lobster districts; (2) Fishing for lobsters on Sunday will be prohibited in all districts after April 10, 1969; (3) Provision allowing jointly owned and operated lobster boats to fish additional traps have been terminated. However, boats that were in this category last year will retain this privilege, subject to certain qualifications; (4) Future changes in ownership of licensed boats must be registered promptly with the Department of Fisheries.

Measures to Improve Incomes

The new regulations are a sequel to the measures to improve fishermen's incomes announced Jan. 20. These placed an upper limit on the number of boats allowed to fish in the Maritimes in 1969 and thereafter. (Canadian Dept. of Fisheries, Feb. 27, 1969.)

* * *

MARITIME PROVINCES LANDINGS INCREASE

The January 1969 catch of the Maritime Provinces--Nova Scotia, New Brunswick, Prince Edward Island--indicated their fisheries were off to a very good start.

Maritime Fish Landings, Jan. 1969 and 1968

	Jan. 1969	Jan. 1968
Landings (million lbs.)	32,919	17,945
Total value (million C$)	2,319	1,133
Price per pound (C$) . . . . (paid vessel by first buyer)	0.0704	0.0631

Landings, total value, and price per pound were well above Jan. 1968. The improved catch was attributed to unusually good weather. Only haddock, halibut, and scallop landings were below normal. (U.S. Consul, Halifax, Feb. 25, 1969.)

* * *

SEMIFACTORY TRAWLER FOR FROZEN HERRING PRODUCTION TO BE BUILT

The Nova Scotia Fishermen's Loan Board has granted a loan for construction of a steel midwater trawler. Described as a semifactory vessel, it will be the first of its kind in Canada.

The vessel, capable of staying at sea for 15 days, will carry a crew of 22. It will be 155 ft. long overall, is designed to displace 950 long tons, and will have a 13.5 knot cruising speed. It will fish food herring.

Packed & Frozen Aboard

Herring will be graded, packed, frozen on deck, and stored in a fish hold at -20° F. When removed from the vessel the fish will be placed in refrigerated containers.

The owners have contracted to supply Industrial Importers of Hamburg, Germany, 10,000 metric tons of frozen herring a year. ('Canadian Fisherman,' Mar. 1969.)

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Canada (Contd.):

FISHERIES MINISTER DISCUSSES INTERNATIONAL FISHERY ISSUES

Speaking to the United Fishermen and Allied Workers' Union in Vancouver on Feb. 1, 1969, Canadian Fisheries Minister Jack Davis presented his ideas on several major international fishery problems.

He said: "Only by managing our fish resources in a more effective way will be able to enjoy a higher standard of living all around. We need to cooperate with other nations in the best possible management of all of the fish resources available to mankind. Each species should be assessed, managed and fished with an eye both to maximizing our future food supplies and producing the best possible return to the fishermen themselves. Canada. . .must press for another Conference on the Law of the Sea. This must come and come soon.

"I would like to see Canada press, not only for better conservation, but also for the best possible management of fish resources everywhere. I would like to see the nations of the world agree on the establishment of broader and more realistic fishing limits. By broader and more realistic fishing limits I mean whole fishing zones which describe those great areas of the sea in which most of our commercial species live out their natural lives. I mean the Continental Shelf in the case of bottomfish. I mean natural boundaries, such as the boundaries of the Continental Shelf, as opposed to artificial lines negotiated and drawn by politicians who have little or no understanding of the life cycle of the fish themselves.

"I believe that the United Nations should actually be responsible for the development of all our fisheries on the 'high seas.' International treaties will no doubt continue to be a useful device. But the United Nations is a better forum in which to develop many of these international understandings. Fishermen would, of course, be active over great areas of the deeps. But their entry into this great international fishery would be restricted in various ways. It would be limited so that their total fishing effort would bear the proper relationship to the amount of the resource and by the need for the fishery to renew itself as the years went by.

"Each nation would be left to manage the resources living out over its own Continental Shelf. It would keep an inventory of the fish stocks within its own Shelf areas and it would follow their movements using the latest electronic devices which technology can provide.

"Of course each nation would license its own nationals to take many of these fish. But. . .each host nation would also license foreign fishermen to operate inside its own Shelf areas as well. These outsiders would, of course, have to pay a fee. They would have to pay a fee in order to help defray the host country's management costs. But if there are species of fish in which a country, like Canada for instance, has no immediate commercial interest--fish which may nevertheless be cropped without damaging the total resource--then why not let others take these fish in order to feed hungry people living in other and less fortunate lands?"

* * *

1968 LANDINGS WERE 16% OVER 1967's

Statistically, 1968 was a good year for Canadian fishermen. Landings reached 2.8 million short tons, 16% over 1967. Landing value rose C$19 million to $169.6 million, 13% over 1967. Herring, salmon, ocean perch, and cod made up the bulk of the increased landings and higher total values.

Selected Species	Landings		Value	
	1968	1967	1968	1967
	. . (1,000 Lbs.) . .		. . .(C$1,000) . . .	
Atlantic Coast:				
Cod	587,296	520,898	24,889	23,424
Haddock . . .	90,737	102,763	6,829	6,815
Pollock . . .	33,793	32,739	1,149	1,291
Flounder & sole	226,673	236,459	7,889	7,745
Herring . . .	1,152,467	757,293	12,287	8,140
Ocean perch .	201,871	173,078	5,250	4,475
Swordfish. . .	7,338	8,005	3,728	3,293
Lobsters . . .	37,322	34,920	24,515	23,254
Scallops . . .	15,648	14,711	13,399	8,138
Pacific Coast:				
Halibut . . .	28,319	26,222	7,080	6,631
Herring . . .	6,319	116,742	162	1,828
Salmon . . .	168,220	133,185	43,656	36,001
Cod	10,764	11,179	732	776
Total . . .	2,766,163	2,388,970	169,571	150,321

Source: 'Monthly Review of Canadian Fisheries Statistics,' Dec. 1968.

Despite the fact that landings, exvessel value, and market value of fishery products were generally high--reaching record levels in some cases--for much of the industry 1968

Canada (Contd.):

was a difficult year. Increased living costs and higher operating costs cut deeply into apparent gains.

* * *

GOVERNMENT TIGHTENS CONTROLS ON FOREIGN FISHING VESSEL ENTRY

On March 18, 1969, the Canadian Department of Fisheries announced tightened controls on foreign fishing vessels in "Canadian territorial waters or fishing zones." The controls will take effect May 1, 1969, in the coastal waters and fishing zones around Nova Scotia, New Brunswick, and Prince Edward Island.

License Requirements

According to Department officials, the tightened controls are primarily aimed at better control over the increased number of foreign fishing vessels. The key element is the requirement of a license for each entrance of a foreign fishing vessel into permissible entry ports.

Little Effect on U.S. Vessels

The officials said the controls will not make much difference to U.S. fishing vessels. Since U.S. fishing vessels normally do not enter Maritime ports for supplies--but only for shelter, engine trouble, or to offload sick crew men--their requirements for the C$1 license are not expected to be large. Heretofore, only an annual entry license was rerequired. (U.S. Consulate, Halifax, Mar. 26.)

* * *

C$4.2 MILLION ALLOTTED FOR LOANS TO GROUNDFISH PROCESSORS

Fisheries and Forestry Minister Jack Davis has announced that the Canadian Federal Government will make loans to companies processing frozen groundfish products. A fund of C$4.2 million has been set up for this purpose. The loan plan is designed to overcome the problems facing companies that are short on working capital and unable to obtain financing elsewhere. It is part of a general Government plan to aid both fishermen and processors.

Loan Conditions

Davis said the loans will be made at the government borrowing rate plus 2%. Principal need not be repayed for 5 years. Interest payments also may be deferred for 5 years. Half the money may be available to the borrowing company on April 1, 1969, or as soon thereafter as the loan is approved. The remainder may be drawn down in equal installments on July 1, 1969, and Oct. 1, 1969.

Davis emphasized that all loans are conditional upon the processor's agreement to pay fishermen prices for groundfish (cod, ocean perch, and small flatfish) equal to prices paid for similar quality fish in 1968.

* * *

BUILDS FIRST OYSTER HATCHERY

Canada's first oyster hatchery, at Freeland, Prince Edward Island, was scheduled to be ready this spring.

Oyster harvesting in the Maritime Provinces has dwindled to almost subsistence level due to environmental hazards and disease. However, scientists are firmly convinced that the industry can be rejuvenated through carefully controlled rearing methods. It is thought that, eventually, oyster farming could exceed the financial returns Canadian fishermen now get for lobsters.

Mobile Hatchery

The decision to build the C$9,600 oyster hatchery was based on the success of a mobile hatchery constructed by the Department of Fisheries. This large trailer will tour the maritime region to interest fishermen and others in the new process. ('Fishing News International,' Jan.)

* * *

ST. PIERRE WILL HAVE NEW FISH WAREHOUSE

Albert Pen, St. Pierre-et-Miquelon's representative in the French Senate, has announced that construction of a huge refrigerated warehouse was scheduled to begin this

Canada (Contd.):

spring on one of the new wharves in St. Pierre Harbour. It will contain about 28,000 square feet of refrigerated fish storage space for Dutch, French, and West German fishing companies.

He said that the warehouse will permit European fishing vessels to land catches on the western side of the Atlantic and return to the fishing grounds, instead of returning to European ports each time a full load is taken.

Program to Attract Foreign Vessels

The refrigerated warehouse, expected to be ready by November, is another step in the continuing program of modernizing and expanding the facilities on the French islands to attract foreign fleets operating on the Grand Banks. Although some European fleets still visit St. John's on a more or less regular basis, St. Pierre facilities for servicing and provisions are attracting more and more foreign trawlers.

Other facilities built at St. Pierre within the past few years include modern ship-repair facilities and a large, new, artificially formed harbor. ('Canadian Fisherman,' Apr.)

* * *

PRODUCTION STARTS AT NEW NEWFOUNDLAND PLANT

A new fish-meal factory was officially inaugurated on Oct. 24, at Isle aux Morts, on the southwest coast of Newfoundland. Isle aux Morts is very close to Port aux Basques, which has an excellent harbor and a year-round railway ferry connecting Newfoundland and Nova Scotia.

Built on the site of a former filleting factory, the new plant will be particularly important to Isle aux Morts. It will provide, among other things, an adequate supply of water to the islanders' homes.

The plant has 2 production lines, each with a 500-ton/24-hour capacity. There is also room to instal another 500-ton/24-hour production line.

Production Processes

The fish is pumped from the boats to the top of 2 steel storage tanks, dewatered, and weighed on an automatic belt scale. Each tank holds enough fish for 36 hours' production. Each is equipped with a system for circulation of blood water to prevent bridging of fish in the tanks. Screw conveyors transport the fish from the tanks to a feeding apparatus common to both lines. This apparatus automatically regulates the feed to 2 cookers. Discharge of raw material from the tanks is automatically controlled by level-regulating membrane switches installed on the feeding apparatus. Before entering the double-screw presses, the boiled fish passes through rotating prestrainers. The presscake then goes to disintegrators for further fluffing prior to drying.

Direct Fired Dryers

Two amply dimensioned direct-fired dryers are arranged so both production lines can be operated in series, with either dryer as pre-dryer. The dryers also can be operated in parallel and supplied by either press. Both are equipped with return-screw conveyor for meal recirculation.

The dryers have automatic temperature controls and automatic fire alarms and fire extinguishers.

Treatment

The meal is carried to the meal storage from the dryers by screw conveyors. Before grinding and bagging, it passes a magnet-removing tramp iron. The meal bags are flattened between rollers for easier stacking. All meal is treated with antioxidants immediately after leaving the dryers.

Sludge & Stickwater Used

Sludge and particles of dry matter are removed from the press-liquid by 3 cylindrical vibrating sieves and returned directly to the presses. The sludge is returned to the production together with the stickwater concentrate. (An automatic triple-effect stickwater evaporating plant has been included.) The factory manufactures only whole meal; the stickwater concentrate is added to the presscake immediately after the presses.

Oil Separation

Oil is recovered from the press-liquid by 3 automatically controlled separators. The oil is pumped to large settling tanks, purified, and pumped to storage tanks. ('Canadian Fisherman,' Apr.)

EUROPE

Norway

WINTER HERRING FISHERY CALLED WORST IN CENTURY

After almost total failure in 1967, Norwegians had hoped the winter herring fishery would come back in 1968. But this winter's catches, through mid-March, were even worse than the year before. Fishing began during the third week of February as small schools approached the coast. Full migration was expected the first week of March, but bad weather curtailed fishing. Only a few fishing days have been possible since and results have been called "miserable." About 150 purse seiners participated.

"Storsild" and "Vårsild"

After this poor start with the early "storsild" fishery, Norwegians hoped the following "vårsild" season would bring catches up to a more respectable level. The ripe, prespawning winter herring arriving at the coast are called "storsild" (large herring). The spawning and spawned-out fish are "vårsild" (spring herring). Because of quality differences that affect the market value, there is a "cut-off day." Before that day, all herring caught are considered storsild, after that they are vårsild. The "cut-off day" this year was March 12.

Good Fishing in Faroese Waters

One bright spot was the excellent fishing reported in late March near the Faroe Islands. Much herring caught by Norwegian and Faroese boats in the area was very high quality and was sold for human consumption. Some was sold even by boats not equipped with refrigerated seawater tanks.

Capelin Fishery Excellent

The capelin fishery at North Norway also provided excellent results; catches up to mid-March were double those of the same period last year. A total of 370 purse seiners and trawlers were in the fishery off Finnmark and the Island of Senja. The latter ground is shallow and vessels with deep seines have experienced difficulties and suffered much gear damage. Heavy catches burst the nets of some vessels. (U.S. Embassy, Copenhagen, Mar. 28.)

* * *

TO EVALUATE COASTAL SALMON FISHERY

In the wake of protests against the prohibition of drift gill net-fishing for salmon inside Norwegian base lines, the Department of Agriculture announced that scientific investigations of the salmon fisheries will be extended and intensified. The objective will be to evaluate the effect of the netting prohibition. A committee is being considered to conduct economic evaluations of this fishery and its regulation.

Agriculture Minister Defends Ban

The Minister of Agriculture has defended the prohibition. He said that several possibilities were considered to find a way of reducing the salmon harvest. It was decided that total prohibition of drift gill-netting inside a certain boundary would best provide the needed protection. He pointed out that if an international agreement to control the salmon fishery beyond the limits is desired, Norway must seek to limit the damage from drift gill-net fishing within its own jurisdiction.

Longlining Begins Earlier

The longline fishery beyond the limits off North Norway began much earlier this year than in previous years. The first vessel arrived on the grounds by mid-February. There are serious doubts in Norway about the quality of salmon caught so early. (U.S. Embassy, Copenhagen, Mar. 28.)

* * *

PROHIBITS DRIFT GILL-NETTING FOR SALMON INSIDE BASELINES

Effective Feb. 7, 1969, Norway prohibited drift gill netting for salmon, inshore from Norwegian territorial sea baselines. This action was taken to reduce exploitation of salmon stocks. The Ministry of Agriculture, responsible for freshwater fishery resources including salmon runs, had pushed this prohibition.

Possible Extension of Ban

Extending the prohibition against drift gill-net fishing beyond baselines, either to

Norway (Contd.):

territorial limit or to 12-mile fisheries limit, will be considered during coming months. The prohibition inside baselines affects only Norwegian fishermen.

Fishermen Protest

Protests have developed in wake of the ban; the fishermen claim it will mean a catastrophic loss of income. The Fishermen's Association, declining to seek special exceptions for certain areas, will accept nothing less than complete withdrawal of the prohibition.

High-Seas Long-Line Fishery

Long-line fishing for salmon within the Norwegian fisheries limit has been forbidden for some time. Some officials would like to ban the long-line fishery beyond the Norwegian fisheries limit. This fishery, carried on in international waters by Danish and Swedish fishermen, could be prohibited only by international agreement.

Administration Change Sought

The Fisheries Director (Ministry of Fisheries) stated that the prohibition was effected by the Ministry of Agriculture before the Fisheries Directorate heard of it. Resulting controversy has evoked a demand that the administration of salmon and trout fisheries be removed from the Ministry of Agriculture, and placed under the Ministry of Fisheries. (U.S. Embassy, Copenhagen, Mar. 7.)

* * *

ALL SEALING MADE SUBJECT TO CONCESSION

Sealing operations in all sealing grounds will be subject to Government concession, according to a Royal Decree of March 21. Sealing operations in the Northeast Atlantic have been subject to concession since 1965. The Ministry of Fisheries says a concession can be granted to anyone who conducted regular sealing operations for at least 3 years during 1964-68. Sealing must be carried out in the same vessel used in that period. The Ministry may grant dispensations from this rule, provided the applicant is known to be, or have been, connected with the sealing industry and possesses the necessary qualifications. The sealing must be justifiable in terms of a rational exploitation of the stocks. The Ministry also may stipulate tonnage, engine power, and vessel equipment.

After granting a concession, the Ministry may limit further particular sealing operations by stipulating maximum catch quotas.

Recommended by Biologists

The new regulatory measures were based on recommendations of marine biologists made several years ago. The Ministry has been considering the recommendations since then. (U.S. Embassy, Oslo, Mar. 28.)

* * *

EXPLORATORY VESSEL FINDS GOOD FISHING ON GEORGES BANK

The distant water longliner 'Pero', chartered by Norway's Institute for Marine Research for a 2-month exploratory cruise, found "very good" stocks of cod on Georges Bank. This happened after an initial period when catches were not impressive. One metric ton of fish, gutted weight, was taken on 2,000 hooks. She also found significant quantities of herring.

Cruise Results Reported

Frequent reports of the cruise results have been carried in the Norwegian trade paper 'Fiskåren.' The most recent report--"Possibilities for Norwegian Utilization of Herring Stocks on the American East Coast"--included a detailed account of the West German herring fishery on Georges Bank (published earlier in a German trade paper).

The report commented that the distance to Georges Bank is too great, even for vessels with refrigerated sea-water tanks, to return catches to Norway for processing. However, there should be good possibilities for vessels that can process herring on board, and for factoryships that can fillet herring for freezing, and produce meal and oil from the waste.

Exploration to Continue

During the second week of March, while 'Pero' was weatherbound near Nova Scotia, the crew reported shoals of herring all around the vessel. Fishing was to proceed farther west and north as soon as the weather improved. (U.S. Embassy, Copenhagen, Mar.28.)

Denmark

CATCHES AND EXPORTS ROSE IN 1968

In 1968, Denmark's fishing fleet made record catches and her fishery exports reached new highs. Favorable weather throughout the year made a record number of fishing days possible. Prices generally were up from the 1967 low. Although exvessel prices averaged slightly lower for some species, a larger catch made up the difference. It provided higher overall earnings.

Catch

According to preliminary data, the 1968 catch was 1.4 million metric tons, more than 40% over 1967. This puts Denmark in third place--behind Norway and Spain--among Europe's leading fishing nations. Denmark will rank about 11th in the world.

Export Earnings

Fishery products exported from Denmark provided over US$133 million in exchange. Denmark ranks fifth among the world's leading fish exporting countries; she is surpassed only by Peru, Japan, Norway, and Canada.

Fishery products contributed about 5% of all Danish export earnings. About 8% (by value) is exported to the U.S., 40% to the Common Market, and 40% to EFTA countries.

Greenland Fisheries Unsatisfactory

Greenland fisheries were the one unsatisfactory area in 1968; cod catches were substantially smaller than in previous years. (U.S. Embassy, Feb. 20, 1969.)

United Kingdom

BLANKET OF PLASTIC BALLS SPEEDS GROWTH RATE OF YOUNG FISH

To sustain the high growth rate of young sole being reared experimentally in warmed sea water, some of the tanks will be blanketed with floating plastic balls during the coming winter. Careful measurements have shown that ball blankets minimize heat losses. These losses are particularly heavy at low air temperatures.

The experiments are being carried out by the British White Fish Authority at Hunterston, Scotland. The aim is to develop a fish-farming technique to a point where industry can take it up as a commercial proposition.

Shortens Growing Period

Experiments at Port Erin, in the Isle of Man, have shown that tens of thousands of eggs spawned by such fish as plaice and sole can be successfully hatched in captivity; only a small percentage survives in the open sea. The Hunterston work has shown that sole can reach market size in 2 years, instead of 4 required in the open sea. Ball blankets during the winter, and improved feeding methods, may reduce this growing period to 18 months.

Reduces Heat Loss

The insulating ball blanket technique, or Allplas system, is widely used in industry on heated open process tanks. Independent tests have shown that the system reduces open tank heat losses up to 70% and evaporation by nearly 90%. Within certain limits, the size of the ball has no bearing on the results. Therefore, it is a matter of choosing a size most appropriate for the application.

Keeps Growth Rate Steady

At Hunterston, a constant flow of sea water enters the fish tanks at between 61° F. and 64° F. Under adverse winter conditions, a ball blanket keeps the tank's temperature at 59° F. This is not only ideal for the growing fish, but 13° F. higher than the open sea in winter. The current experiments may prove that reducing heat losses from warmed water helps to maintain a steadier growth rate in winter.

Details of Allplas balls and their suppliers throughout the world are available from Allplas AG, Alpenstrasse 12, Zug, Switzerland. ('Canadian Fisherman,' Mar. 1969.)

* * *

BUILDS 'SEABED CRAWLER'

A seabed crawler designed to work on the Continental Shelf (as deep as 100 fathoms) is being built by a British shipyard and Britain's National Research Development Corp. It will cost about US$850,000. The government will provide 50% under long-term loan arrangements.

Launched from a mothership, the crawler will wind down to the seabed on a presunk weighted cable. Power will be supplied by

United Kingdom (Contd.):

cable from the surface. It will move on 4 large wheels powered by electric motors.

The Vehicle

The vehicle will have 2 compartments: one at normal pressure for the driver and an expert in the operation; another, open to the sea, from which divers can operate. The latter can also serve as a decompression chamber during and after return to the surface.

The vehicle will be fully equipped for communication with the surface and between command compartment and divers. It will also contain life-support systems and carry lighting and closed circuit TV. ('Canadian Fisherman,' Mar. 1969.)

West Germany

NEW FISH-WASHING MACHINE DEVELOPED

A new machine to wash a variety of fish has been developed by the German firm, Baader of Lubeck. The Baader 670 fish-washing machine is suitable for both gutted and whole fish. It is claimed that the extremely compact machine can be installed on board a vessel athwartship.

Operating Characteristics

The hexagonal drum-shell-type machine has an incorporated worm 6 inches high and turning rails. A centrally mounted water pipe washes the fish during its run through the machine. Dirty water, discharged through gill-shaped openings in the drum shell, runs to a water-collecting tray under the drum and drains off through an outlet pipe.

The drum, fitted between 2 synthetic spur rings, is supported by plastic rollers. Drive for the drum is provided by a combined spur and gear rim.

Size

The machine is 144 inches long, 47 inches wide, and 57 inches high. The 38-inch-diameter drum is about 118 inches long. ('Fishing News,' Mar. 14.)

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USSR

ARTIFICIAL CULTURE OF SEA STURGEON ATTEMPTED

In early April 1968, scientists of the All-Union Research Institute of Fisheries and Oceanography began an experiment in artificial culture of sea sturgeon, *Acipenser sturio*. Tests were performed in the area of Poti on the Black Sea. Three females were placed in a 5 x 7 x 1.2 meter enclosure at the mouth of the Rioni River. Despite stagnating water, salinity exceeding 15 parts per million, and water temperatures of 12 to 15.4° C. (54 to 59° F.), eggs were obtained, fertilized and incubated. Some hatched larvae were observed. The outlook for future large-scale sea sturgeon farming is promising.

Endangered Resource

The sea sturgeon, a valuable marine fish, was once native to the North Atlantic. It occurred along European coasts from North Cape to Black Sea, and along American coasts from Hudson Strait to South Carolina. The resource has been almost completely detroyed. Today, sea sturgeon spawns only in the Rioni River and is found only in the Black Sea.

Characteristics

Sea sturgeon reaches a length of 130-140 centimeters (cm) and a weight of 20-25 kilograms (kg) in 8 to 10 years. Specimens 2 meters long weighing 50 kg have been encountered. Russian sturgeon, *Acipenser guldenstadti*, is somewhat smaller and lighter at this age (100-110 cm and 10-12 kg). Male sea sturgeon are mature at 7 to 9 years, and females at 9 to 12--2 to 5 years earlier than the Russian sturgeon. Unlike other Acipenseridae, sea sturgeon can withstand high salinity and fairly low water temperatures. Its food is mainly anchovy and other small fish. It spawns a month earlier than Russian sturgeon, usually in the lower reaches of rivers, 80 to 120 km from the mouth. ('Rybnoe Khoziaistvo,' No. 12, 1968.)

* * *

70-80 PURSE SEINERS FISH MACKEREL IN NORTH SEA

The skipper of the Norwegian vessel 'Borgøygutt,' interviewed after his return from mackerel fishing in the North Sea, reported: "Norway has about 35 vessels fishing

USSR (Contd.):

on these North Sea grounds, but we are not the only ones there. At the Viking and Patch Banks, we saw a Soviet fleet surpassing the total fleets of all other countries. They have 70-80 power block-equipped fishing vessels supported by large motherships. I would estimate there were about 10 Soviet factory vessels ranging in size from about 3,000 to 20,000 deadweight tons." He saw only 2 Soviet gillnetters.

"The Soviet effort seems successful," the captain added. "Their purse seines fish deep and they have the most modern gear. When the purse seiners have a full load, the motherships come alongside and take the fish directly on board. This is a rational and fast method." ('Fiskåren,' Mar. 6.)

* * *

SEINERS FOR PACIFIC FLEET BEING BUILT IN SIBERIA

A new production line for oceangoing seiners has been set up at Sretenskii Shipyard, in the southeastern Siberian province of Chita. The hulls, reinforced to withstand ice pressure, will have up-to-date navigational equipment and communications systems. The gear issued will depend on the fishery in which the seiners are to be used.

More Comfort for the Crew

The fishermen will sleep in greater comfort: instead of the 6-man bunks provided in previously built seiners, the new type will have 2- and 4-berth cabins. (Various Soviet news agencies.)

North Pacific Deployment

The shipyard is on the River Shilka (see photo). The Shilka flows into the Amur River, dividing Mainland China from the USSR. As the Amur flows into the north Pacific, these seiners may be destined for north Pacific fisheries close to Soviet shores. This would explain the reinforced hulls.

Workers at Sretenskii Shipyard in southeastern Siberia build oceangoing seiner. (Photo: Tass)

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USSR (Contd.):

FISHERIES MINISTER REPLIES TO REPRIMAND

The reply of Fisheries Minister A. Ishkov to a reprimand from the Soviet Council of Ministers has been published by 'Vodnyi Transport,' official organ of the Merchant Marine Ministry and the Trade Union of Merchant Seamen. The Council had blamed 'weak leadership' of the Fisheries Ministry for inefficient use of the fishing fleet, failure to meet the growing demand for fishery products, and inefficient market promotion.

In his reply, Minister Ishkov stressed that the 1968 catch plan had been fulfilled 103%--6.7 million tons landed, 230,000 more than in 1967. He pointed to a 101% fulfillment of the 1968 sales plan. He noted that 68% of all fishery enterprises had switched to the new economic planning and stimulation system. Over 1 billion cans of fish had been packed. And, between 1966 and 1968, the fishing fleet had received 500 new vessels, including floating fish canneries, refrigerated fish carriers, and floating bases.

Notes Production Changes

Ishkov also reported production changes. Salted fishery products (except herring) dropped to 7% of total production from a recent 40%. Fresh-frozen production amounted to 60%. Production of fillets, sprats, sardines, and saury canned in oil increased. Production of canned fishery items amounted to 12% of total production of edible fishery products. He said that both quality and variety of edible fishery products have improved greatly over the past 3 years.

Announces Targets For 1969

He announced that targets for 1969 include increases in nearly all branches of the fishing industry: 7.4% in profits; 7% in sales; 10.4% in output of edible fishery products; 11.8% in canned fish; 14% in fillet production, and 35% in pond fisheries. The fleet is to receive 366 new large tonnage units.

Other targets are new fish-processing combines for Leningrad, Minsk, Volvograd, Alma Ata, and Donetsk; expansion of repair, docking and mooring facilities in all major fishing ports; and new rest homes for fishermen in Vladivostok, Nakhodka, Arkhangelsk, and Murmansk.

Stresses Switch to New Economic System

Ishkov said fish industry performance in the future will no longer be measured in terms of quantity of catch, but in ruble value of the output of edible fishery products. This change has been dictated by the need to meet growing demand for products of better quality. The fishing fleet has been directed to increase catches of higher-priced species.

Emphasis in the current year will be on continued conversion to, and development of, the new economic system. Results of the past $1\frac{1}{2}$ years show greatly improved production efficiency, expanded personal initiative, and better use of basic capital. The fishing industry combines fishing, processing, packaging, ship repair, etc. So new planning and more effective stimulation methods must be developed to find better use for the rapidly growing fixed productive capital.

Criticizes Fishery Administrations

The Minister severely criticized several principal fishery administrations. He rapped the Far Eastern, Western, and Azov-Black Sea Administrations for not fulfilling 1968 catch quotas. He criticized poor fleet utilization. About 46% of the high-sea vessels (many belong to the administrations under fire) failed to fulfil the 1968 plan. He censured 'certain administrative executives' for tolerating systematic violations of vessel deployment schedules. He attacked the Far Eastern, Western, and Azov-Black Sea administration for 'brutally violating' fleet-repair schedules.

Ishkov also deplored the slow progress in mechanizing cumbersome fish catching and processing operations aboard vessels. This prevents effective crew cuts and operational cost reductions. He added that current educational and professional crew-training programs are inadequate. ('Vodnyi Transport,' Feb. 18.)

Council Reprimand

The Council's reprimand was a resolution titled 'Additional measures to improve the efficiency of the fishing fleet, better the quality, and expand the selection of fishery production.' It was adopted in late January 1969. (See CFR, April 1969, p. 54.)

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USSR (Contd.):

TO BUY IRANIAN CAVIAR

New prices for Iran's Caspian sturgeon and caviar exports to the USSR were set by the Iranian State Fisheries Organization and the Soviet Commercial Bureau on Mar. 15, 1969. All prices will be 25 to 30% higher than previous USSR-Iran trade contract prices. This will bring them to the level of world prices for these commodities.

The Agreement

Under the 3-year agreement, Iran will sell to the USSR 1,000 metric tons of sturgeon and 70 tons of caviar. The new prices will give Iran an additional 150 million rials a year.

The USSR also agreed to deliver a fleet of fishing vessels to Iran. The Soviets also will assist Iran in building inland hatcheries. ('Kayhan International,' Mar. 16.)

Poland

PROMOTES SALES OF HER FISHING VESSELS

Poland is actively promoting foreign sales of her fishing vessels. Here are 2 examples:

The CENTROMOR firm has commissioned Canadian naval architects of Montreal to undertake a design study for a fresh-fish stern trawler suitable for use off Canada's east coast. In the past, European-designed trawlers have not been found ideal for the rugged conditions off Canada.

Vessel Characteristics

The 172-ft., 2-deck stern trawler will be powered by a 1,600-hp. diesel with a service speed of about 13 knots. The engineroom will be forward, and a 315-ton capacity hold aft. A crew of 18 to 20 will be housed in single or 2-berth cabins. A model has been thoroughly tank-tested. Special care has been taken to insure stability under adverse weather conditions, particularly in ice.

Advanced Design

The trawl winch will be well forward of the bridge superstructure but beneath the deckhouse. This will allow safe working positions, and free almost the whole length of the deck for easier hauling. The advanced design may make the new vessel class equally suitable for some European fishing nations. ('Fishing News International,' Jan.)

Demonstrating Trawler in Ireland

In Ireland, CENTROMOR organized demonstration trips of a 96-ft. Polish TR27A-type stern trawler. The trips were made from Howth, Castletownbere, Killbegs, and Cork, in March 1969. Irish skippers were invited along.

The prototype of this series, 'Sola,' was introduced in 1968 as a replacement for the 78-ft. side trawlers used by the Polish fleet.

A basic unit in a number of models offered by the Gdynia Ship Repair Yard, Sola was designed by the Vessel Design Bureau of Gdansk. The Sola class vessels can carry a 9-man crew on trips of up to 20 days.

Layout

Sola's general layout is very practical. There is a central fishing control position at the afterside of the wheelhouse, which is set forward. Main engine and propeller remote controls are housed on the bridge. The 140 cu.m. capacity fish hold is insulated with styrofoam, lined with wood and hydronalium, and cooled down to a temperature of 0° C. Fresh-water tanks have an 8.9 cu.m. capacity, and fuel oil tanks 55.9 cu.m.

Gear

Deck machinery is hydraulically powered from a main engine take-off. The trawl winch comprises 2 separate units. On the stern gantry above the slipway, 2 hydraulically powered warp blocks can be moved from the outer side of the gantry to the middle just above the slipway.

After the main trawl warps have been taken on the twin trawl winches, the doors are secured to the stern, and the cables clipped on to the auxiliary wires for hauling inboard. At this time, the blocks are moved to their inner position and the trawl wings are taken up the center slipway. When these are aboard, the cod ends are taken aboard by a gilson from an auxiliary drum. For shooting the procedure is reversed. ('Fishing News,' Mar. 14.)

Iceland

FISHING INDUSTRY DEVELOPMENTS

Record catches of capelin were made in March. The 1969 catch reached 100,000 tons; this compared with just over 78,000 tons for all of 1968, and a little over 97,000 in 1967. All storage facilities were full. Landings were running up to 10,000 tons a day. Capelin was being stacked in open areas to await reduction. Capelin meal prices were reported rising. Much of the meal was sold as soon as processed.

Capelin for human consumption is being tested by the Japanese, who had several technicians in Iceland last year. Iceland exported about 500 tons of frozen capelin to Japan in 1968 and has contracted to sell 750 tons in 1969.

White Fish

White fish catches had been somewhat lower than in 1968 due to strikes and poor weather. Catches in March were improving. However, the trawler catch was similar to last year's, and over 3,000 tons of iced fish had been sold in England and West Germany in January.

Marketing Developments

A sales contract, negotiated in February with Soviet trade representatives, provided for Icelandic sales of 21,000 metric tons of fishery products, including 13,000 tons of frozen fillets, during 1969.

The firm Einar Gudfinnsson of Bolungarvik has been experimenting recently with catching and processing scallops and other mollusks for the U.S. market. The quantity of available raw material reportedly is abundant. The quality of the product is good, but production and processing are still on a trial basis.

Technological Developments

On March 11, the West German shipbuilder, Uterwesen of Bremerhaven, contracted to build a US$2.4 million research vessel for the Icelandic Government. The 'Bjarni Saemundsson,' will be a stern trawler 49 meters long and 800 gross tons. She will be the first Icelandic ship powered by a diesel-electric system and be able to trawl at greater depths than any other Icelandic vessel.

Some Icelandic boats soon will be equipped with an improved purse seine, invented by Ingolfur Theodorsson of the Westman Islands. It has already been tested, with excellent results. The net purses faster than existing seines.

On-board tests of the Lowe-Temp seawater ice maker are about to start in Icelandic waters. It is produced by a company in Longwood, Florida. The ice maker already has been tested ashore by the laboratory of the Fisheries Research Institute. It is believed the new equipment (which produces ice flakes from undiluted sea water) may increase quality and value of catch of the groundfish boats through improved cooling. (U.S. Embassy, Reykjavik, Mar. 20.)

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LANDINGS AND UTILIZATION, 1967-68

	Year	
	1968	1967
	. . . (Metric Tons1/) . . .	
Landings by Species:		
Cod	234,653	204,403
Haddock	34,386	38,664
Saithe	38,032	29,036
Ling	8,896	7,724
Wolffish (catfish)	8,972	10,278
Cusk	4,873	2,722
Ocean perch	30,571	30,039
Halibut	1,054	1,040
Herring	142,820	461,533
Capelin	78,166	97,165
Shrimp	2,451	1,508
Other	14,423	12,484
Total	599,297	896,596
Utilization:		
Fish:		
Quick frozen	202,237	167,203
Stockfish (unsalted)	15,174	59,396
Canned	1,444	82
Smoked	21	19
Salted	115,178	70,454
Reduction	4,431	2,515
Herring:		
Salted	28,834	53,469
Frozen (bait)	9,024	15,735
Reduction	132,631	473,240
Home consumption (fish)	7,015	8,549
Crustaceans:		
Frozen	4,825	4,155
Canned	113	84
Home consumption	3	-
Fish landed abroad	78,367	41,625
Total	599,297	896,526

1/Whole ungutted fish.
Source: 'Hagtidindi,' Mar. 1969.

LATIN AMERICA

Mexico

1968 FISHERY PRODUCTION WAS ONLY 2.8% ABOVE 1967

Mexico's 1968 fishery production was 240,071 metric tons, only 2.8% more than 1967, according to preliminary data from the Secretary of Industry and Commerce. It had increased 12.8% from 1966 to 1967.

Fishery Production (Preliminary)			
Species	1968	1967	1966
	. . . . . . (Metric Tons)		
Shrimp	36,061	42,719	39,743
Oysters	24,484	20,168	19,921
Sardines	27,889	29,634	18,761
Anchovy	15,883	22,755	13,748
Mackerel	7,056	5,973	5,247
Grouper	5,717	4,630	7,767
Abalone	3,404	2,691	2,778
Spiny lobster	1,337	1,571	1,386
Other	72,597	67,447	62,154
Total Edible	194,428	197,588	171,505
Kelp	28,229	20,141	22,212
Fish meal	11,433	10,163	9,602
Other	5,981	5,541	3,644
Total Industrial	45,643	35,845	35,458
Total Production	240,071	233,433	206,963

Shrimp landings, off 9.4% in volume for first-half 1968, continued to decline during second half; at year's end, these were 15.6% less than in 1967. Industrial products, led by kelp, moved ahead of 1967 by 27.3%. Fish meal production continued to climb slowly upward, increasing 12.5%.

Shrimp No. 4 Export in Value

Shrimp exports, mostly to the U.S., were worth 676 million pesos (US$54.08 million), down 15.6% from 1967. Still the most important fishery product in dollar value, the recent high market prices moved shrimp back to fourth place in value among all exports (after cotton, sugar, and corn). (U.S. Embassy, Mexico, Mar. 6.)

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THE FISHERIES OF CIUDAD DEL CARMEN

Ciudad del Carmen lies at the western end of Isla del Carmen, on Campeche Bay, at the southern end of the Gulf of Mexico. It depends almost entirely on shrimp for its economic stability. Unlike other Mexican Gulf ports, where finfish play important role, shrimp is king in Carmen. Finfish are handled only in some smaller plants catering to the domestic market.

Fish and Shrimp Production in Carmen		
	Quantity	Value
	Metric Tons	US$1,000
1967	8,308	5,954
1966	8,059	6,656
1965	7,741	6,664
1964	8,446	6,990

Processing Plants

Ten shrimp-processing plants in Ciudad del Carmen process and pack shrimp for export--all to the U.S. Almost all of the exported product is peeled, deveined, and individually quick frozen (IQF), except for occasional small packs of larger sizes (10-14 and 15-20 shrimp per pound) in the green headless form.

Shipment to the U.S. is mostly by refrigerated truck, although some is shipped by refrigerated vessel. Combined production capacity of the 10 plants is 90,000 pounds a day of IQF (about 112,000 pounds of green headless shrimp). In order of size, the plants are: Productos Refrigerados, Isla Camaronera, Mariscos del Carmen, Congeladora del Carmen, Naviera Rex, Perla del Golfo, Booth Fisheries de Mexico, Congeladora Jomar, Congeladora Mexicana, and Fausto Cruz. Eight smaller plants process and pack shrimp and fish for domestic consumption.

Ice Production

There are 8 ice plants, each associated with a shrimp-processing plant. The combined daily capacity is 275 tons of block ice. Most of this goes to the shrimp vessel fleet for icing catches, but some is used in the plants. Several plants have flake-ice machines to supply in-plant needs.

Freezing-at-sea equipment has been introduced on a few vessels recently. A growing interest in this equipment has led to the local design and manufacture of an on-board freezer at a cost considerably below the better-known U.S.-built equipment. However, this locally built machinery is still quite new, and has to establish its reliability and trouble-free operation.

Mexico (Contd.):

Fleet Size & Maintenance

Carmen's shore plants are supplied by a fleet of 320 shrimp vessels of varying types, ages, horespower, and condition. All use modern double rig shrimp gear. Most plants have their own marine railways and repair yards to maintain and repair their own vessels and those supplying them. There is also a small shipyard presently building new shrimp boats, both wood and steel. (Regional Fisheries Attaché, U.S. Embassy, Mexico, Mar. 18.)

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NEW FISHERIES COUNCIL
FORMED IN CAMPECHE

On Mar. 5, 1969, the newly formed Fisheries Council for the Campeche area launched an ambitious program to develop and improve the fishing industry. The Council is composed of representatives of the local trade association branch, the federal fisheries bureau, ice manufacturers, vessel owners, packers and processors, repair and maintenance services, fisheries unions and cooperatives, health department, and the State of Campeche.

Council Goals

The Council's objectives are: (a) improvement of the economic condition of the fishing industry and upgrading its products; (b) improvement of sanitary conditions on vessels, docks, and processing plants; (c) upgrading of training and competence of fishermen; and (d) increased knowledge of resources, particularly shrimp.

The Council plans to attain these objectives by pooling resources and efforts of the industry and government participants. As a first step, several Council members have drawn up proposed rules for sanitary practices aboard vessels and in processing plants. Mexico's fishing industry attaches great importance to the subject of improved sanitary practices.

May Spread to Pacific

The initial group in the Council represented interests in the Campeche area only. Later, neighboring fishing centers such as Ciudad del Carmen, Progreso, Veracruz, Alvarado, and Tampico will be invited to join in a comprehensive program covering the whole Gulf of Mexico coast. Mexico's Pacific Coast fishing industry, which provides about 70% of Mexico's annual production, may adopt some form of fisheries council in the future. (Reg. Fish. Attaché, U.S. Embassy, Mexico, Mar. 31.)

Peru

EXPORT TAXES ON
FISH PRODUCTS REINSTATED

Certain export taxes on fishery products have been reestablished by Peru (Mar. 12, 1969). This was done because a 1967 law abolishing them had reduced the fiscal revenue required to finance the national budget, and had suppressed funds essential for national defense.

The new law virtually invalidates the benefits accorded by the 1967 law, No. 16694. Reestablishment of a 5% stamp tax on exports is considered a heavy burden to the industry. The provisions of the new law will be valid for 5 years, from April 1, 1968.

Reinstated Taxes

A 5% ad valorem stamp tax on exports of fish products (payable on the f.o.b. price) has been reinstated. A 5% stamp tax had been waived on both domestic transactions and exports of fish products by the 1967 law. The 1969 law exempts only domestic transactions.

Fish & Whale Oil

There will be a tax of US$5.16 a metric ton on crude fish and whale oil, and US$3.87 a metric ton on semirefined fish and whale oil. These export taxes on fish oil were originally imposed in 1965 and abolished in 1967. Refined or hydrogenized fish and whale oils are not subject to these export taxes.

Other Taxes

Other export taxes established in 1967 remain:

1% on f.o.b. Peruvian port price on fish and whale meal.

Peru (Contd.):

2% on f.o.b. Peruvian port price a metric ton on crude fish oil when export price does not exceed US$160 a metric ton; 4% when export price is higher.

1% on f.o.b. Peruvian port price a metric ton on semirefined fish oil when export price does not exceed US$170.00 a metric ton; 2% when price is higher.

All the above taxes, except the 5% stamp tax, are collected as advance payment of industrial and profit taxes. The 5% stamp tax is chargeable only to general expenses.

Suspension of 5% Tax

In response to intense industry opposition, the law reintroducing the 5% ad valorem tax on fishery products exports has been suspended for 2 months, effective Mar. 28. The suspension does not affect the other individual taxes on fish and whale oil. (U.S. Embassy, Lima, Mar. 27 & Apr. 11.)

* * *

FISH MEAL PRODUCTION AND EXPORTS, JAN.-FEB. 1967-69

Production of Peruvian fish meal was low in February 1969 due to a short closed season that limited fishing to the southern part of Ilo. Exports remained high, however, due to good demand. (U.S. Embassy, Lima, Mar. 27.)

Fish Meal Production and Exports, Jan.-Feb. 1967-69

	1969	1968	1967
	...... (Metric Tons)		
Production:			
Jan.	240,495	284,021	287,466
Feb.	17,357	191,575	109,644
Total	257,852	425,596	397,110
Exports:			
Jan.	140,283	192,056	100,281
Feb.	185,938	188,222	115,673
Total	326,221	380,278	215,954
Stocks on hand Feb. 28	315,556	689,039	552,359

The 7 leading buyers, in first 2 months of 1969, were West Germany, 43,949 metric tons; Continental U.S., 43,748 tons; Netherlands 33,290; East Germany, 29,464; Spain, 26,843, and U.K., 20,456.

Chile

ANCHOVY CATCH, FISH MEAL & OIL PRODUCTION, 1966-68

Although far fewer plants operated in 1968 than in 1967, fish meal production increased 46%. During 1968, about 175,900 metric tons of fish meal and 28,000 tons of fish oil worth US$20,087,300 were exported. Most meal went to the U.S. and West Germany. The Netherlands took 90% of the oil.

Anchovy Catch, Fish Meal & Oil Production, Jan.-Dec. 1966-68 1/

	1968	1967	1966
	...... (Metric Tons)		
Total landings of fish and shellfish at major ports.	1,216,796	886,927	1,225,816
Anchovy catch:			
Dec.	61,500	61,300	18,000
Jan.-Dec.	963,300	708,600	1,072,300
Anchovy fish meal prod., major ports:			
January	31,403	16,343	33,547
February.	24,669	20,608	27,318
March	7,665	8,703	14,054
April	2,024	1,651	14,786
May	5,729	3,765	27,013
June.	30,069	16,948	19,031
July	29,428	14,279	18,046
August.	36,638	6,304	18,014
September.	6,103	11,730	12,819
October	1,049	12,933	3,235
November.	7,214	8,206	2,137
December.	12,111	11,502	3,664
Jan.-Dec.	194,102	132,972	193,664
Meal production from fish other than anchovy, south of Antofagasta:			
Dec.	1,870	2,450	2,700
Jan.-Dec.	42,600	33,000	27,000
Anchovy fish oil prod., major ports:			
Dec.	1,700	1,300	600
Jan.-Dec.	29,100	10,300	19,200
Oil production from fish other than anchovy, south of Antofagasta:			
Dec.	142	282	218
Jan.-Dec.	4,736	4,125	3,425
1/Some figures rounded.			

Protein content of fish meal produced in December 1968 averaged 65%. The price varied between US$123-138 c. & f. (Instituto de Fomento Pesquero, Informe Mensual No. 12, Feb. 12.)

Cuba

FISHING INDUSTRY IS GROWING RAPIDLY

Cuba's rapidly expanding fishing industry may become one of Latin America's leading seafood exporters. But the industry is hampered by a lack of trained personnel. Some question whether disproportionate amount of investment has not been made for the returns.

New Markets

Despite this, the industry's outlook appears bright. Cubans themselves are developing a taste for more fish, a necessity because of chronic meat shortages. And a ready market exists in Western Europe for Cuba's spiny lobsters, shrimp, and other seafood. Most of Cuba's fishing exports go to France, Italy, Britain, and to socialist countries. Most of these exports represent new markets created by Cuba's need to pay for machinery and equipment.

Catch Increases

A new US$38 million fishing port near Havana was built by the Soviets in 1967. Since 1959, fishery production has almost quadrupled. Total catch in 1968 was an estimated 82,000 metric tons, compared with 22,000 in 1958. If present plans are realized, the 1968 record will be more than doubled to 200,000 tons by 1971. The forecast is based on an expansion program to increase substantially the tonnage of the fishing fleet, and its docking and storage facilities.

Shrimp Fleet Expands

Emphasis is given to increase the shrimp-fleet catch. Cuba recently acquired 90 steel-hulled shrimp trawlers almost exactly like those used by U.S. companies in Texas and Florida. Also, 12 shrimp vessels will be built in Cuba for 1969 delivery. Cuban shrimp vessels are intensifying operations off Venezuela, near mouth of Orinoco River, and off Surinam, Guayana, and French Guiana.

By 1970, Cuba expects to have 300 vessels and catch 10,000 metric tons of shrimp annually.

State-Run Industry

The industry is administered by the National Fishing Institute established in 1963 following a technical-assistance agreement with the Soviet Union. It is a sprawling agency that directs 3 fleets, fishing port of Havana, fishing cooperatives, warehouse and transportation units, a big shipbuilding facility, canning units, a scientific research center, and an export company. ('The Wall Street Journal,' Apr. 1.)

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SPAIN BUILDS STERN TRAWLER

The super-trawler 'Mar Caribe' was being completed for Cuba at one of the Vigo (Spain) shipbuilding consortium yards in Jan. 1969. It will be one of Cuba's largest fishing vessels.

The 315-foot vessel, powered by a 4,000-hp. diesel engine, is equipped with a full Baader processing factory. She will carry a crew of 82 and have hold capacity for about 2,000 metric tons of frozen fish. The vessel was ordered originally by Spanish owners and launched as the 'Arcos.' ('Fishing News International,' Jan.)

The first of 5 more stern trawlers ordered from East Germany was delivered Jan. 19.

ASIA

Japan

REPORTS 1968 EXPORTS

In 1968, Japan exported 7.85 million cases (7-oz. 48's) of canned mackerel--2.51 million cases of natural pack and 5.34 million cases of tomato sauce and other packs. The sharp rise--55% from 1967 total of 5.07 million cases--was due primarily to increased purchases by the Philippines and South Vietnam. The former bought 1.3 million cases of natural pack and 2.7 million cases in tomato sauce and other packs; the latter 43,000 cases of natural pack and over 1.2 million cases in tomato sauce and other packs. Exports to the U.S. totaled 318,000 cases of natural pack and 7,000 cases in tomato sauce. ('Suisan Tsushin,' Feb. 12.)

Frozen Tuna Exports Steady

Frozen tuna exports were 107,084 metric tons valued at about US$41.1 million, compared to 107,132 tons and $45.4 million in 1967. Albacore tuna exports were down sharply--12,754 tons below 1967--but yellowfin and skipjack exports were up.

The 4 leading buyers were the U.S., 36,371 tons; Puerto Rico, 27,630; Italy, 24,954; and American Samoa, 5,757. ('Suisan Tsushin,' Feb. 10, 1969.)

Other Frozen Fish

Exports of swordfish, shrimp, saury, and squid increased, while oyster shipments declined sharply.

Exports of Other Selected Frozen Fish Products, 1968

	1968		1967	
	Quantity	Value	Quantity	Value
	Metric Tons	US$	Metric Tons	US$
Saury	14,367	4,382,661	12,953	4,294,000
Squid	12,526	4,188,492	11,825	3,108,958
Sea bream	9,494	1,466,472	9,607	1,526,036
Shark	4,935	3,032,511	4,379	2,260,489
Swordfish fillets	4,809	4,981,900	3,511	2,595,922
Swordfish steaks	2,226	2,900,386	1,811	1,732,178
Mackerel	3,044	573,167	3,268	595,236
Rainbow trout	2,563	2,315,600	2,406	2,425,033
Shrimp	2,312	5,309,330	1,286	2,497,211
Spearfish	711	384,325	785	394,578
Oyster	571	425,036	1,310	738,339
Salmon	18	26,856	24	38,050

Sharks previously were exported mostly to Italy but, since 1967, Holland and West Germany have become the major buyers. In 1968, Holland took 2,294 metric tons (1967--1,992), West Germany, 1,554 tons (1,515), and Italy 972 (700).

Frozen saury exports have increased steadily in recent years. In 1968, shipments to American Samoa totaled 3,099 tons (1967--3,275 tons), Mauritius 1,705 tons (1,245), Canary Islands, 1,205 tons (1,060), and Malaysia 1,184 (717). ('Suisan Tsushin,' Feb. 12.)

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REPORTS 1968 IMPORTS
OF TUNA AND OTHER FISH

Frozen tuna imports in 1968 totaled 28,964 metric tons worth about US$10.7 million--79% higher in volume and 84% in value from 1967 imports of 16,184 tons worth $5.8 million.

Okinawa was the leading supplier with 9,692 tons (6,407 in 1967). Imports from Taiwan rose sharply from 2,061 tons in 1967 to 7,407 in 1968. Purchases from the Trust Territory of the Pacific Islands (Marshall, Marianas, and Caroline Islands) jumped from 278 tons in 1967 to 1,613 in 1968.

Other suppliers were: South Korea, 3,854 tons; New Hebrides Is., 1,592; American Samoa, 1,374; Malaysia, 1,139; Libya, 431; Panama, 377; U.S., 342; Fiji, 288; Italy, 253; Philippines, 253; and others, 349.

Imports of Other Selected Fishery Products (Not Canned)

Product	1968		1967	
	Quantity	Value	Quantity	Value
	Metric Tons	US$	Metric Tons	US$
Spanish mackerel	8,605	3,762,728	9,417	4,043,400
Squid	8,503	2,584,561	5,166	1,563,167
Salmon roe	5,016	14,989,728	2,765	7,503,850
Herring	4,277	716,661	3,372	552,433
Croaker	3,392	744,728	5,013	1,085,847
Hairtail	2,308	450,133	4,605	887,428
Salmon & trout	2,232	2,022,961	1,483	1,164,839
Yellowtail	1,382	754,364	469	356,689
Sea bream	1,146	367,544	1,556	516,067

Other Fish

Data on other fish imports (not canned) show salmon roe increasing sharply. These

Japan (Contd.):

rose from 2,765 metric tons in 1967 to 5,016 tons in 1968, reaching the 5,000-ton level for the first time. The U.S. supplied 3,663 tons (1967--1,888 tons) and Canada 1,343 tons (872).

Salmon and trout also were about 800 tons over 1967 imports. Leading suppliers were the U.S. with 1,293 tons (1967--1,019 tons), USSR, 485 tons (100 tons), Communist China, 303 (277), and Canada 170 (10). ('Suisan Tsushin,' Feb. 6 & 7.)

* * *

1969 TUNA FISHERY STARTS SLOWLY

In Jan.-Mar. 1969, the 4 Japanese purse seiners in the eastern Pacific yellowfin tuna fishery did not fare well because of unfamiliarity with local fishing conditions. However, recent reports indicate they finally found some good grounds off Mexico.

Indian Ocean

In the western Indian Ocean, the good yellowfin run that developed in early 1967 and 1968 was absent this year. Fishing was generally poor, except near the Arabian Sea where some vessels were making good catches. Several dozen Taiwanese long liners in the western Indian Ocean also experienced poor fishing.

Atlantic Fishing

In the Atlantic, fishing was also generally slow except in the Gulf of Guinea. There, yellowfin fishing began picking up. Some vessels were taking 3-4 tons per operation. In the central equatorial Atlantic, 14 Japanese long liners based at Sao Vicente, Cape Verde Island, were averaging 3 tons per operation (80% albacore). The Mar. 1969 price for Atlantic-caught albacore transshipments from Sao Vicente to Puerto Rico was quoted at f.o.b. US$421 a short ton. ('Suisan Tsushin,' Mar. 22.)

* * *

TUNA FISHERY REGULATION URGED

Scientists at the tuna research meeting in Tokyo, March 11, 1969, warned that continued tuna fishing at or above the present level would deplete western Pacific stocks. Noting the fate of whale resources, they urged adoption of a workable catch regulation for tuna. The meeting was sponsored by the Japan Fishery Resource Conservation Assoc.

The scientists were Drs. Hayashi and Suda of the Far Seas Fisheries Research Laboratory, Fisheries Agency. They reported that the recent sharp decline in hook rate in the southern bluefin fishery had caused vessels to shift to other grounds worked by S. Koreans and Taiwanese. This will increase fishing pressure and deplete resources. The scientists said that resource management must include tuna species other than southern bluefins.

Threaten Other Tunas

Dr. Hayashi said the vessels shifting to new grounds may concentrate next on other tunas, such as big-eyed, and deplete the resources. He urged that fishing be reduced to half the 1966 effort, when 90 million hooks were used, to restore the resources.

During the past few years, Dr. Suda stated, it had been wise to hold the tuna fleet at the 1963-64 size. In the earlier period, the fleets were divided between those fishing for export trade and those supplying domestic market. This achieved a balance of harvest. When "immense interest" in southern bluefins developed, effort concentrated on certain species. One species was overfished, then another.

"It is becoming increasingly necessary to regulate the tuna resources," he emphasized.

Management Proposals

Dr. Suda proposed 2 important steps to manage the resources:

1) Establish restrictions on area, fishing season, vessel operations, and a catch quota by species and area.

2) Japan should persuade S. Korea and Taiwan to discuss resource management. Japanese efforts alone have been "relatively weak."

Although Japan has stopped increasing her tuna fleets, other nations have increased their fishing capacities to around 100,000 tons. Competition of Japanese with these fleets in the new areas will deplete the resources. ('Suisan Keizai Shimbun,' Mar. 14.)

* * *

Japan (Contd.):

PRICES RISE ON FROZEN TUNA EXPORTS TO U.S.

Because U.S. fishermen were making good yellowfin tuna catches in the eastern Pacific in early April, major U.S. west coast packers were not importing yellowfin. However, some smaller packers continued buying actively from Japan. Prices for frozen, gilled-and-gutted yellowfin were c.i.f. US$427.50 a short ton, a slight increase over earlier prices. Frozen round albacore rose to c.i.f. $530 a short ton, somewhat above the $515-520 in 1968.

Albacore in Demand

Export demand for albacore in early April continued brisk owing to strong buying interest by major U.S. packers. But practically all Japanese trading firms are out of supplies. According to some firms, albacore prices are continually rising because of supply scarcity and may remain high even after the summer albacore fishery begins. Because domestic packers are eagerly waiting to buy the summer catch, it may be difficult to obtain export supplies.

Puerto Rican Deliveries

In the Indian and Atlantic oceans, albacore are said to be small and not suitable for packing. Those taken off Angola, where fishing was gradually picking up, were 20-40 pound size. Grade A fish were bringing c.i.f. $440 a ton and grade B $390 a ton, delivery Puerto Rico. ('Katsuo-maguro Tsushin,' Apr. 4.)

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FROZEN TUNA EXPORT TARGETS SET FOR BUSINESS YEAR 1969

The Japan Frozen Foods Exporters Assoc. has adopted frozen tuna and frozen swordfish export targets for business year (BY) 1969 (Apr. 1, 1969 to Mar. 30, 1970).

Canada & U.S.

The target for frozen tuna exports to the U.S. and Canada is 75,000 short tons, 25,000 tons less than the 100,000 tons in 1968. The goal for frozen tuna loins and discs exports to Canada and the U.S. is 4,500 tons. The 1969 frozen swordfish export quota for the U.S. and Canada is 5,500 short tons.

Overseas Bases

The export targets for overseas bases, reduced 50% from 1968, are (in metric tons): American Samoa, 12,500 tons; Espiritu Santo, New Hebrides Island, 3,000 tons; Fiji Island, 4,500 tons; Penang, Malaysia, 3,000 tons; Saint Martin Island, West Indies, 1,000 tons.

For other areas, the export goal for the new business year is 35,000 metric tons. ('Katsuo-maguro Tsushin,' Mar. 20.)

* * *

CANNED TUNA IN BRINE STOCKS DROP, PRICES RISE

The Tokyo Canned Tuna Sales Co. had about 750,000 cases of export canned tuna in brine in stock at the end of 1968. Practically all of it was sold by late March 1969. This left the company virtually no stock for the new business year (BY) beginning April 1. This occurred because of the buying rush by trading firms. The firms, assessing the recent low canned tuna output by domestic packers and the production outlook, felt they would face supply shortage unless they stocked up immediately. This was especially true because some major trading firms had been buying all can sizes, particularly the 4-lb. cans (6 to case), since around mid-Feb. Consignment of production to the Sales Co. by domestic packers has fallen far below expectations this year. The trading firms do not foresee any large increase in output before the summer albacore fishery starts in early May.

BY 1969 Canned Tuna in Brine Export Prices 1/

Case & Can Size	White Meat, Solid		Light Meat, Solid	
	Old Price	New Price	Old Price	New Price
	. . . . (US$/Case)			
7-oz. 48's	11.01	11.11	8.40	8.49
13-oz. 24's	10.18	10.33	7.72	7.86
$66\frac{1}{2}$-oz. 6's	11.58	12.06	8.97	9.30
$3\frac{1}{2}$-oz. 48's	6.56	6.66	-	5.11
$6\frac{1}{2}$-oz. 48's	8.01	8.11	-	6.13
6.6-lb. 6's	19.94	20.67	-	15.98
6.6-lb. 6's Chunk	-	18.49	-	14.29

1/Ex-warehouse, Shimizu, Japan.

Export Prices Rise

The company announced a slight increase in export prices on April 1. The price revision was made because of the company's stock situation and the U.S. tariff cut of 1% (effective

Japan (Contd.):

Jan. 1, 1969) on canned tuna in brine imports in 1969. ('Suisan Tsushin,' Apr. 1.)

* * *

SEINERS FISH YELLOWFIN IN EASTERN PACIFIC

Four Japanese purse seiners entered the tropical eastern Pacific yellowfin tuna regulatory area in Feb. 1969, and began fishing in early March.

'Hakuryu Maru No. 55' (500 gross tons) and 'Gempuku Maru No. 82' (500 gross tons) fished off Ecuador. By early Mar. 1969, they had caught 50 tons and 10 tons of yellowfin, respectively.

'Hayabusa Maru No. 3' (275 gross tons) caught about 30 tons off Costa Rica. Her catch per day of operation--about 10 tons, more than twice the quantity normally taken by long line--is low compared to large U.S. seiners that catch as much as 30-40 tons a day. Her owners are hoping for a haul of at least 12-13 tons a day or 370-380 tons a month.

The 'Nissho Maru' (252 gross tons) was scheduled to start fishing in early March. All 4 vessels were searching for productive grounds in second week of March.

Performance Rating

It is too early to draw any definite conclusions concerning the performance of the seiners. However, some Japanese believe that their handicaps are already apparent--slower speed, 10 knots compared to 15-16 knots for U.S. seiners, and slower net-sinking speed compared to U.S. gear. ('Suisancho Nippo,' Mar. 11, and 'Katsuo-maguro Tsushin,' Mar. 7.)

* * *

EEL PRICES SET RECORD

A shortage of cultured eel has pushed prices at Tokyo wholesale market to a record US$1.28 a pound. This topped the earlier high of $1.26 in Osaka. Since January 1969, prices have risen almost 50 cents a pound. Eel processors, displeased over this trend toward a sellers' market, are considering suspending sales promotion.

Broiled eel is very popular in Japan. ('Minato Shimbun,' Apr. 1.)

* * *

1968/69 ANTARCTIC WHALING ENDS

The 3 Japanese whaling fleets participating in the 23rd Antarctic whaling expedition ended operations Mar. 22, 1969. All attained assigned targets. Japan was assigned a quota of 1,493 blue-whale units (BWU) for the 1968/69 season. ('Shin Suisan Shimbun Sokuho,' Mar. 26.)

Catch & Production	
	No. of Whales
Catch:	
Fin.	1,821
Sei.	3,495
BWU's	1,493
	Metric Tons
Production:	
Frozen	72,475
Whale oil	27,520
Salted	2,035
Solubles & others	3,257
Total	105,287

* * *

YAIZU LANDINGS DECLINED IN MARCH

Landings at the leading tuna port of Yaizu in March 1969 totaled 15,315 metric tons worth US$5.85 million, about 2,000 tons below the March 1968 landings of 17,002 tons worth $6.08 million. The decline was attributed primarily to the sharp dip in albacore tuna landings, down nearly 85% from comparable 1968 landings. ('Nihon Suisan Shimbun,' Apr. 11.)

	Quantity			Average Price		
	1969		1968	1969		1968
	Mar.	Feb.	Mar.	Mar.	Feb.	Mar.
	. . . (Metric Ton) . . .			. (US$/Short Ton) .		
Tuna:						
Bluefin[1/].	4,980	3,712	4,906	706	785	670
Albacore .	225	251	1,521	479	492	358
Skipjack .	3,962	2,946	4,717	267	284	214
Mackerel .	5,347	3,018	5,288	73	115	93
Others . . .	800	435	570			
Total. .	15,314	10,362	17,002			

1/Includes yellowfin and big-eyed tuna.

* * *

Japan (Contd.):

SUMMER ALBACORE TUNA FISHERY STARTS SLOWLY

The summer albacore tuna fishery is considerably later this year than in 1968. In early April last year, about 3,000 metric tons of pole-caught albacore had been landed at Yaizu. This year only a small quantity under-22-pound albacore had been landed by the same time.

Some Expect Improvement

The summer albacore forecast, published by Tokai University, indicates that the rather weak flow of warm waters off Bonin Islands (southeast of Tokyo) could be expected to delay formation of the main fishing school considerably. However, since the oceanographic conditions this year resemble those in 1965 (an excellent catch of 42,000 tons) and 1967 (fair catches of 28,000 tons), some observers expect a good summer albacore fishery. ('Suisancho Nippo,' Apr. 10.)

日本

Republic of Korea

COLD STORAGE COMPANY GETS INTERNATIONAL LOAN

The Asian Development Bank announced a US$7 million loan to the Korea Cold Storage Co. (KCSC) on March 13. The loan, guaranteed by the Government of the Republic of Korea (ROK), will be amortized over $15\frac{1}{2}$ years, including a 4-year grace period; annual interest is 6.9%. Five Japanese commercial banks have agreed to participate in the loan--each with US$100,000. The loan will assist the development of fisheries, a high priority sector in Korea's development program.

Asian Development Bank Assistance

This is the first time specific financing has resulted from a technical assistance program undertaken by the Asian Development Bank. In March 1968, the Bank entered into a technical assistance agreement with the ROK Government and its Agriculture and Fisheries Development Corporation (AFDC) to help organize and develop AFDC activities. AFDC, established in Nov. 1967 as a government-owned statutory corporation, is charged with developing and promoting the storage and processing of agricultural and fishery products. Most of the technical assistance was completed in 1968, although 2 refrigeration and fishery experts are still serving in Korea under the agreement. The most important project proposed for Bank financing was the construction of processing facilities for fishery products intended for local markets. In July 1968, AFDC established a subsidiary--KCSC--to undertake this specific project.

Project Facilities

The loan to KCSC will finance foreign exchange costs of freezing, cold storage, ice-making, ice storage, and supplementary processing facilities in Seoul, Pusan, Mokpo, and Mukho; marketing facilities in Seoul, and transportation equipment. The total cost is estimated at US$18.2 million, including working capital funds of US$2.9 million.

Fisheries Problems

ROK's fisheries provide a livelihood for about 6% of her population, but low productivity of fishermen and inadequate distribution facilities hamper an increase in the living standard of fishermen. Efforts to expand fishery catches have been successful, but deficiencies in marketing and distribution have prevented full benefits from being realized. Prices of fishery products have been increasing faster than those of other foodstuffs, and fishery products continue to be too expensive for many Koreans.

Project Goals

KCSC will seek to eliminate bottlenecks in marketing and distribution by developing adequate freezing and cold-storage facilities and an efficient marketing system in Seoul. The facilities will enable the company to buy fishery products during peak periods and sell them off-season. This will eliminate price fluctuations due to seasonal changes of supply. Acquisition of refrigerated land transportation equipment and carrier vessels, also included in the project, will permit efficient operation and utilization of the planned facilities. (U.S. Embassy, Manila, Mar. 13.)

SOUTH PACIFIC

Australia

TUNA CATCH SETS RECORDS
IN NEW SOUTH WALES

By Dec. 14, 1968, the New South Wales tuna catch was a record 4,358 short tons--311 tons above the entire 1967/68 season.

Fishermen used sea-surface temperature maps prepared by the CSIRO Division of Fisheries and Oceanography. CSIRO used a radiometer-equipped charter aircraft. Maps drawn in December showed a remarkable pattern of temperature fronts moving down the coast, providing ideal conditions for tuna schooling. Sixty live-bait pole boats and 37 trolling boats fished for tuna in southern New South Wales waters this season.

New Tagging Scheme

A new tuna tagging scheme was introduced. Fishermen marked selected fish as they were caught, then released them. Up to mid-December, more than 4,000 tuna had been tagged, and about 2,000, tagged in present and past seasons, had been recaptured. ('Australian Fisheries.' Jan.)

American Samoa

TUNA PRICES,
MARCH AND APRIL 1969

Japanese tuna suppliers and U.S. packers in American Samoa agreed to maintain Feb. 1969 prices for March tuna deliveries. The Japanese had sought a $5-a-ton increase (later reduced to $2.50), but U.S. packers refused to grant any increase over Feb. prices.

March prices were, per short ton: round albacore: frozen $415, iced $400; gilled-and-gutted yellowfin: frozen $337.5, iced $317.5. ('Kanzume Nippo,' Mar. 14.)

Prices Up in April

In April, Japanese tuna suppliers and U.S. packers agreed on a $5-a-ton increase for albacore.

The new prices (per short ton) for round albacore are frozen US$420 and iced $405. Gilled-and-gutted yellowfin prices remain at March levels: $337.5 frozen and $317.5 iced. ('Suisan Tsushin,' Apr. 5.)

DO EAGLES SWIM?

On March 10, the biologists at BCF's Auke Bay (Alaska) Biological Laboratory had a ringside seat to the performance of an eagle diving upon a duck so swiftly that the eagle went into the water still holding the duck. The eagle swam to shore and hopped up on a rock, fluttered its wings and then sat there stoically while many of a flock of crows darted about it. After a short rest, the eagle flew across the bay with the duck still in its talons.

AFRICA

South Africa

CAN PILCHARDS FOR PET FOOD

Canned pilchards packed at Walvis Bay as a special brand of pet food will be featured as part of a special spring promotion in the U.S. Eight different brands of canned pet food will be displayed coast to coast by a U.S. company. A quarter of a million cases have been ordered from Walvis Bay this year. ('South African Shipping News and Fishing Industry Review,' Mar.)

South-West Africa

FISH MEAL SEASON IS UNDERWAY

The 1969 Walvis Bay pilchard season started during the first week of February when the first factories sent out fishing vessels. The other factories started in February or the first week of March.

Factoryships

The South African fish meal factoryships, 'Willem Barendsz' and 'Suiderkruis,' arrived off South-West Africa on Jan. 1, 1969, to start their 8-month season. Initial catches were reported poor, with a lot of anchovy present. But, north of Walvis Bay, catches had improved considerably by the third week of Jan.

Land-Based Plants

The 8 land-based pilchard plants--7 at Walvis Bay and one at Luderitz--are limited to a quota of 90,000 short tons each; a special research levy is placed on an additional 6,000 tons. However, as in 1968, the factories will divide the 96,000-ton quota of the new plant, Sarussas Ontwikkelingskorporasie, equally among them. Sarussas' additional quota can be used only after the company has established its factory around Rocky Point, well north of Walvis Bay.

Quotas

The 12,000 ton-per-plant anchovy quota was a concession for 1968 only; it is not known whether it will be extended to the current year. Last year, any anchovy caught in excess of 12,000 tons was deducted from the pilchard quota.

New Plant at Walvis Bay

The 96,000-ton quota granted to the white-fish consortium probably will be processed by the consortium plant now being built at Walvis Bay. It is expected to be operational by about midyear. ('South African Shipping Industry Review,' Feb.)

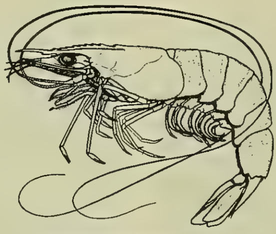
WHERE DO WAVES COME FROM?

The commonly seen waves on the surface are caused principally by wind. However, submarine earthquakes, volcanic eruptions, and tides also cause waves.

A breeze of less than 2 knots (2 nautical miles per hour) can form ripples. As the wind speed increases, larger more visible waves form. The wave height in feet usually will not be more than half the wind speed in miles per hour, although individual waves may be higher.

As long as the wind blows consistently from the same direction, the waves are referred to as sea. When the wind stops or changes direction, the waves that continue in a direction different from that of the local winds are called swell. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

FOOD FISH FACTS



NORTHERN SHRIMP
(Pandalus borealis)

The northern shrimp has traditionally supported a small, highly variable fishery in Maine and Massachusetts. The Gulf of Maine is considered the southern limit of these shrimp in the Northwestern Atlantic. Fishing for northern shrimp is a rapidly expanding industry growing from less than one million pounds caught annually prior to 1964 to over 13 million pounds in 1968. The fishing fleet, including many converted lobster boats, is growing at a comparable pace.

DESCRIPTION

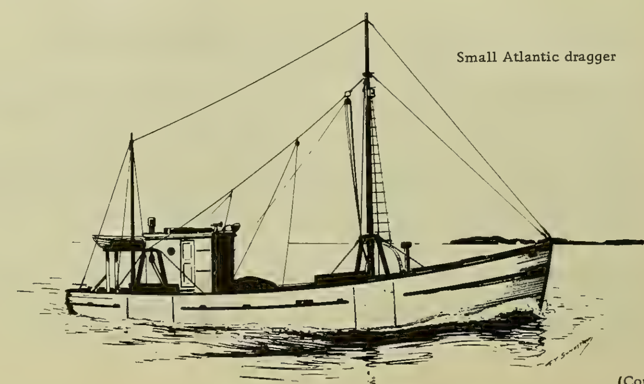
Northern shrimp are pink and are usually three to four inches in length. Some individuals may reach six inches. Their body shape resembles a small lobster or crayfish without pincers or claws.

HABITAT

On the Atlantic coast, northern shrimp are found on muddy or sandy bottoms in water from 150 to 900 feet deep. These shrimp are also found off the coasts of Alaska and British Columbia.

SHRIMP FISHING

Along the North Atlantic coast shrimp are caught from small vessels called otter trawlers or "draggers." The term "draggers" comes from the method of fishing. These boats drag a large flattened cone of nylon netting, called an otter trawl, along the ocean floor. As the net is dragged or towed along the bottom, shrimp are swept into the mouth of the net and concentrated into the bag or cod end.



Small Atlantic dragger

(Continued following page.)

MANAGEMENT AND CONSERVATION

Most northern shrimp are caught during the fall-to-spring months on fishing grounds within a 50-mile radius of Portland, Maine. Northern shrimp are the only species of commercial interest which are concentrated and available in this area during the winter. Because of this, the shrimp have attracted considerable fishing effort throughout the history of the fishery. The catch, however, of these northern delicacies has fluctuated greatly in the years prior to 1964. In 1964 the northern shrimp catch rose to over two million pounds, partly because fishermen began operating further offshore.

Interest in northern shrimp has increased greatly in recent years and, in 1967, BCF began an extensive systematic survey of these shrimp resources. Fishery scientists aboard the research vessel, 'Delaware,' operating out of the Bureau's Exploratory Fishing and Gear Research Base in Gloucester, Massachusetts, made four experimental cruises in the Gulf of Maine during 1967 and 1968. Cruises were made during different seasons of the year to determine if northern shrimp could be commercially harvested at times other than the fall-to-spring months.

Bureau scientists were also interested in: (1) whether shifts in shrimp population occurred from season to season (and, if so, to what extent); (2) boundary limits of these concentrations at different times of the year; (3) production potential of the shrimp population; (4) behavior and accessibility to fishing gear of northern shrimp populations; and (5) biological data, such as spawning seasons and size range, which might be important for commercial utilization of the resource. In addition, fishery equipment specialists tested and modified a new mechanical shrimp-fish separator. Fishery technologists, in search of new ways to get a better product to the consumer, also investigated several new methods of handling freshly-caught shrimp.

USES OF NORTHERN SHRIMP

Shrimp, the most popular of all shellfish, are an excellent source of high-quality protein, vitamins, and minerals. Shrimp are low in calories and fat and have a distinctive flavor. Northern shrimp may be used interchangeably with other varieties of shrimp in any recipe. Northern shrimp range from 40 to 50 per pound when caught. Headless shrimp run from 60 to 70 per pound; and peeled, headless shrimp range from 70 to 90 per pound.

These cold-water delicacies in raw, headless, frozen form are sold in 2- and 5-pound boxes. Peeled meats, which have been individually quick frozen, are sold in 9-, 10-, 16-, and 24-ounce poly-bags or rigid plastic containers. Block frozen, peeled meats in one pound, re-usable, plastic containers were recently introduced to frozen seafood counters. (Source: National Marketing Services Office, Bureau of Commercial Fisheries, U.S. Dept. of Interior, 100 East Ohio, Room 526, Chicago, Ill. 60611.)

(Recipe on p. 60.)

MOVE OVER, MAINE CLAMBAKE!

Shrimp are No. 1 in popularity over all other fish and shellfish in the United States. This is not surprising because shrimp have a distinctive flavor and are so versatile they can be used in appetizers, canapes, dips, chowders, or many pleasing entrees that will satisfy the most delicate or the heartiest of appetites. There are several kinds of shrimp available in the United States. Among the more important ones are tiny, North Pacific shrimp, the Gulf variety, and northern shrimp found off the coasts of Maine and Massachusetts. BCF research vessels have recently located new resources in this area.

Shrimp are all lean meat, low in calories, and a complete, easily-digested protein food as well as being a fine source of needed minerals. They can be served plain or fancy and come in a wide variety of market styles. The tails of shrimp are the only edible portion, and these can be purchased either fresh or frozen, cooked in the shell, or cooked, peeled, and deveined--ready to use. Shrimp are also available in handy-dandy, shelf-ready, $4\frac{1}{2}$- or 5-ounce cans, either packed in brine or dry. Breaded shrimp, ready to fry, can be found at frozen seafood counters.

Maine Shrimp in Wine Sauce, a new recipe from BCF, was created with the moderate-sized northern shrimp in mind; however, any shrimp may be used. This recipe features shrimp in a subtle sauce that is irresistibly delicious. Mushrooms and chopped onion are cooked and added to chicken bouillon, then sour cream and dry white wine are added with the shrimp just before serving. Serve it for hearty appetites over hot, fluffy rice, or show off a little and serve it with toast points or patty shells. Either way, this recipe is a year-round classic that can be served whenever you want the ultimate in good eating.

MAINE SHRIMP IN WINE SAUCE

1 pound cooked, peeled, and cleaned Maine shrimp, fresh or frozen
$\frac{3}{4}$ cup chopped onion
$\frac{3}{4}$ cup sliced mushrooms
$\frac{1}{4}$ cup butter or margarine, melted
3 tablespoons flour
1 cup chicken bouillon
$\frac{1}{2}$ cup sour cream
$\frac{1}{4}$ cup dry white wine
Rice, toast points, or patty shells

Thaw frozen shrimp. Cook onion and mushrooms in butter until tender. Blend in flour. Add chicken bouillon gradually and cook until thick, stirring constantly. Add sour cream, wine, and shrimp. Heat, stirring occasionally. Serve over hot fluffy rice, toast points, or in patty shells. Makes 6 servings.

Three booklets, two in full-color, are available on shrimp and how to cook and use them. They are: "How To Cook Shrimp" (1 49.39:7)--20¢; "Can-Venient Ways With Shrimp" (1 49.49/2:2)--35¢; and "Shrimp Tips From New Orleans" (1 49.4:41)--25¢. Write to the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402. (Source: National Marketing Services Office, Bureau of Commercial Fisheries, U.S. Department of the Interior, 100 East Ohio, Room 526, Chicago, Ill. 60611.)

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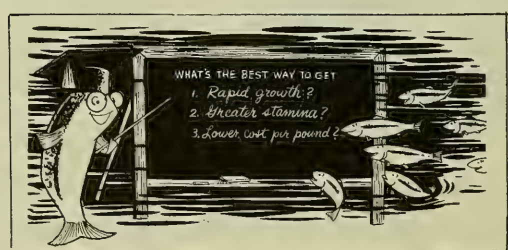


☆ U. S. GOVERNMENT PRINTING OFFICE : 1969 341-147/11

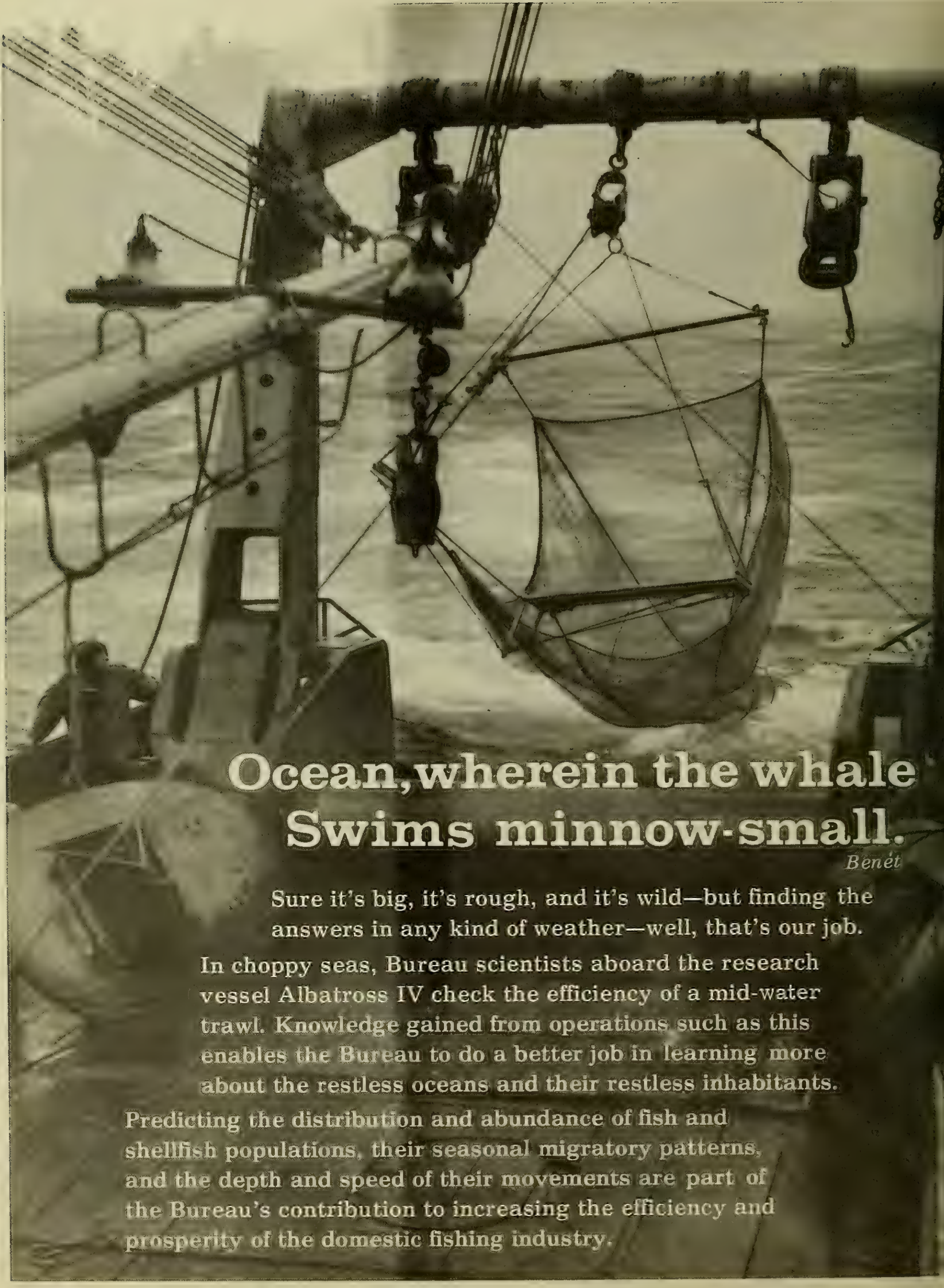
As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES



Ocean, wherein the whale Swims minnow-small.

Benét

Sure it's big, it's rough, and it's wild—but finding the answers in any kind of weather—well, that's our job.

In choppy seas, Bureau scientists aboard the research vessel Albatross IV check the efficiency of a mid-water trawl. Knowledge gained from operations such as this enables the Bureau to do a better job in learning more about the restless oceans and their restless inhabitants.

Predicting the distribution and abundance of fish and shellfish populations, their seasonal migratory patterns, and the depth and speed of their movements are part of the Bureau's contribution to increasing the efficiency and prosperity of the domestic fishing industry.

COMMERCIAL FISHERIES Review

VOL. 31, NO. 6 JUNE 1969

COVER: Captain of gill netter checks his catch.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

Fishermen's Memorial
Gloucester, Mass.

The Bureau of Commercial Fisheries and The Bureau of Sport Fisheries and Wildlife make up The Fish and Wildlife Service of The United States Department of the Interior.

Throughout this book, the initials BCF stand for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

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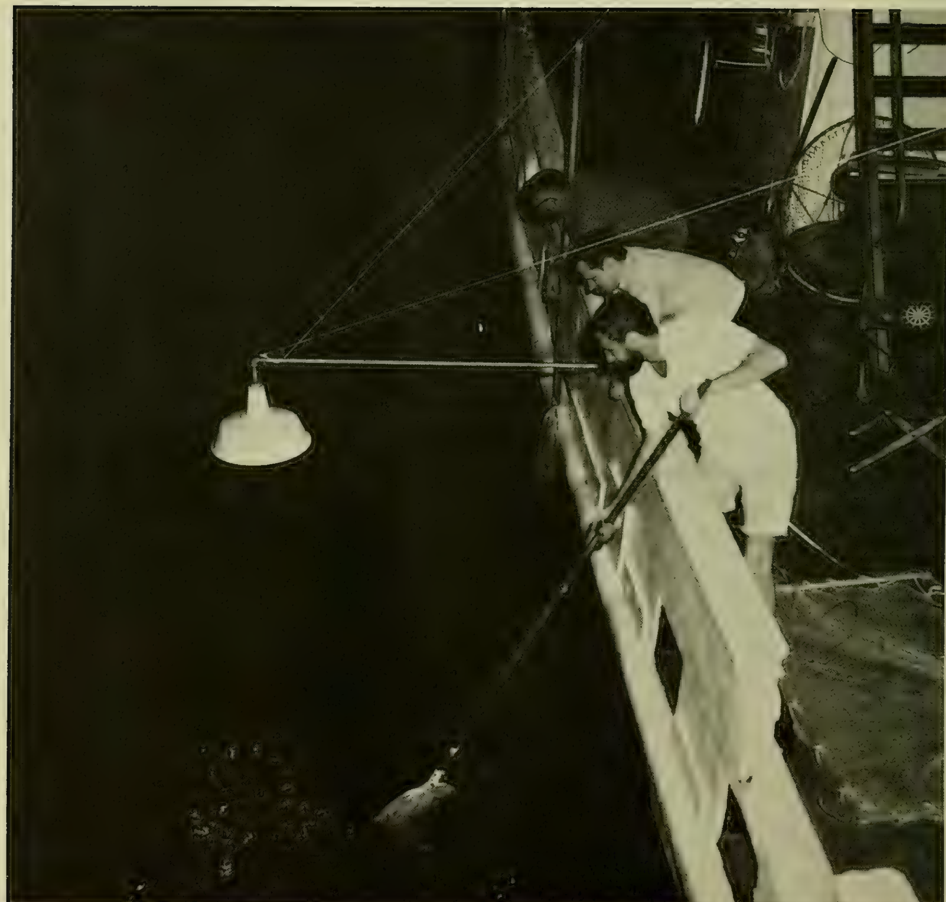


Dip netting at a light attraction station aboard the BCF research vessel 'Oregon'. (Photo: T. Iwamoto.)

GOALS FOR DECADE OF OCEAN EXPLORATION OUTLINED

Objectives for U.S. and world participation in an International Decade of Ocean Exploration during the 1970s are set out by the National Academy of Sciences and the National Academy of Engineering in a new report, "An Oceanic Quest". The report emphasizes the development of U.S. programs that could contribute to the Decade. It analyzes 4 major areas of ocean use: Biology & Living Resources, Geology & Nonliving Resources, Physics & Environmental Prediction, and Geochemistry & Environmental Change.

The concept of the Decade was proposed by President Johnson on March 8, 1968, and described in the May 1968 report of the National Council on Marine Resources and Engineering Development. The Council later asked the Academies to advise on the scientific and engineering aspects of U.S. participation.

The report also emphasizes the need for improved technology to carry out the U.S. mission. Nearly all of the U.S. oceanographic capability--including personnel, facilities, platforms, and special installations--would have to be upgraded.

The report cautions "that if much less than $100 million of new money per year (averaged over the Decade)" is made available for the projects discussed, "it would be undesirable to identify the set of programs as an International Decade of Ocean Exploration." To implement all programs, "as much as $500 million" a year is needed.

THE REPORT

The report proposes this basic objective for the Decade: "To achieve more comprehensive knowledge of ocean characteristics and their change and more profound understanding of oceanic processes for the purpose of more effective utilization of the ocean and its resources."

Despite the emphasis on utilization, it continues, "anticipated benefits are long-term in nature, and justification of the Decade goes beyond immediate economic returns."

These are the four areas covered by the report and the major recommendations:

I. BIOLOGY & LIVING RESOURCES

U.S. Fisheries

- Explore and assess the production potential of many living resources in the Gulf of Mexico and Caribbean Sea and Gulf of Alaska.

- Explore ocean stocks of tuna and tuna-like fish, especially skipjack, in the Eastern and Central Equatorial Pacific. Devise ways to utilize them.

- In Northwestern Atlantic, where many nations fish many species, investigate the interactions. This will provide basis for management policies.

International Fisheries

- Explore "production potential of the oil sardine, mackerel, shrimp, and other fisheries stocks of the Arabian Sea." Encourage countries bordering sea to use more of these resources.

- Investigate potential of krill and deep-water fishes of Antarctic Ocean. Devise ways to extract and to get them to world markets.

- Assess fishery resources of southern Chile and Argentina (in cooperation with local

governments), especially those in semiprotected fjords, where local industries might be encouraged.

- Cooperate with local governments to explore and assess fishery resources--especially stocks of demersal fishes and prawns--of Indonesian archipelago's continental shelf.

II. GEOLOGY & NONLIVING RESOURCES

Continental Margins

- International cooperation to reconnoiter emerged and submerged continental shelf of Atlantic's eastern margin, from northern Norway to Cape of Good Hope. Measure continuously "seismic, magnetic, and gravity parameters, and with bottom sampling and coring, along lines spaced at 50-mile intervals."

- International cooperation in "geological-geophysical surveys of the contiguous shelves and slopes of different countries."

- Help coastal states in "detailed hydrographic surveys in nearshore waters and harbors."

- "Cooperative hydrographic survey and charting of the continental margins."

Small Ocean Basins

- Conduct geological-geophysical investigations of selected basins--Mediterranean, East Indies, Red Sea--to assess mineral-resource potential, especially petroleum.

- Continue deep-sea drilling program. Emphasize small ocean basins and continental margins.

Ridges & Trenches

- On mid-ocean ridges, especially Mid-Atlantic, conduct geological and geophysical studies. These should involve "precise navigation and hard-rock sampling capability with manned and unmanned devices"--and surveys for metal-rich brines.

- Study a trench at a continental margin (Peru-Chile Trench). Dredge and core at sea and sample on land. Conduct geophysical profiles at sea and on land. Carry out "detailed earthquake seismology studies of submarine earthquakes using land-based seismometers."

III. PHYSICS & ENVIRONMENTAL PREDICTION

Monitoring

- Use more ships-of-opportunity and aircraft to collect near-surface oceanographic data. Encourage developing nations to set up "simple shore stations of standard design."

- Establish more-permanent "ship and island midocean monitoring stations." These should include heavily instrumented island observatories.

- Investigate requirements of "an effective system for oceanographic monitoring of the North Pacific."

- "Support pilot studies of new monitoring techniques, such as free-fall transport measuring devices, moored current-meter arrays, deep-sea bottom-pressure records, and air-dropped expendable and retrievable instrument packages."

Air-Sea Interaction

- In Western Indian Ocean, investigate ocean's reaction to monsoonal changes in winds. Use existing numerical model to design observational program.

• In Western Pacific and China Seas, use existing data to build preliminary numerical model.

• In Equatorial Pacific, carry out observational program. Use research vessels, buoys, ships of opportunity, planes, and island stations to explain "large-scale, long-term, ocean-atmosphere interaction."

Deep Ocean

• "Complete world coverage of deep-water temperature, salinity, and dissolved-oxygen measurements. Obtain direct measurements of deep-water flow in selected locations."

IV. GEOCHEMISTRY & ENVIRONMENTAL CHANGE

• "Conduct geochemical survey of selected chemical and radio-chemical substances on meridional traverses in the Atlantic, Pacific, and Indian Oceans."

• Monitor the rate that natural and man-made substances are added to the ocean by rivers and winds.

WHAT TYPES OF ORGANISMS, OTHER THAN SHARKS, ARE POTENTIALLY DANGEROUS TO SWIMMERS?

The most dangerous animal other than sharks is probably the barracuda; indeed it is feared more than sharks by West Indian divers. Its usual length is only 4 to 6 feet, but it is aggressive, fast, and armed with a combination of long canines and small teeth capable of cutting as cleanly as a knife.

Although no authentic record of deliberate attacks on man exists, the killer whale is potentially more dangerous than either sharks or barracudas. This carnivore measures 15 to 20 feet and hunts in packs. It attacks seals, walruses, porpoises, and even baleen whales.

The moray eel, which is as long as 10 feet, lurks in holes in coral reefs and may inflict severe lacerations on a diver who pokes his hand into its hiding place, or it may grasp the diver in its bulldoglike grip until he drowns.

The octopus is probably overrated as a villain because of its evil appearance; nevertheless, its bite is poisonous. The giant squid has been known to pull man beneath the water to his death. The Portuguese man-of-war has tentacles up to 50 feet long with stinging cells which are painful to a swimmer brushing against them.

There is a large group of animals dangerous to swimmers or waders who step on them. These include the sting ray, stonefish, zebra fish, toadfish, and many others. The giant tropical clam (Tridacna), weighing as much as 500 pounds, has been depicted as trapping divers; however, no authentic records exist. ("Questions About the Oceans," U.S. Naval Oceanographic Office.)

UNITED STATES

BCF and Industry Promote New England Pollock

BCF and industry are cooperating in a campaign to shift emphasis from the depleted haddock resource to the underutilized pollock resource. BCF marketing personnel have been assigned to the haddock marketing area.

BCF personnel have made numerous personal contacts in the attempt to fill the market void created by the lack of haddock. As a result, industry has placed sample orders for pollock with chain stores, wholesale distributors, institutional feeders, and restaurants. Most of these establishments want to find out how their customers will react to pollock before committing themselves to large orders. A few already have agreed to accept regular shipments.

Much Publicity

The food chains in particular are anxious to tie in their efforts with the campaign. Many food editors and home economists have agreed to publicize pollock by feature stories, recipes, and fish-cookery demonstrations.

BCF also is conducting short-term explorations and gear testing to assist industry in providing a continuous supply of pollock.

Haddock Abundance Drops Further

A spring groundfish survey completed by BCF's 'Albatross IV' on April 10 showed a further drop in haddock abundance. The vessel completed 270 otter-trawl hauls from Cape Hatteras, N. Carolina, to western Nova Scotia.

The average catch in pounds-per-30-minute haul was $\frac{3}{4}$ of the 1968 survey level and $\frac{1}{3}$ of 1966's.

The decline in BCF's abundance index for commercial-size Georges Bank haddock has continued since 1965. The same trend is seen in the catch-per-day indices of the U.S. haddock fleet.

Decline Inevitable

The decline was inevitable because of attrition of the last good year-class--the one spawned in 1963.

Haddock do not enter the fishery until 2 years old. However, BCF obtains an early indication of the incoming year-class size by measuring, each July, the abundance of 4-month-old haddock on Georges Bank.

'Oregon II' Discovers Scarlet Prawns Off Northeastern South America

Experimental trawling by BCF's Oregon II on the Continental Slope off Surinam and French Guiana revealed concentrations of giant scarlet prawns (bright red shrimp) yielding under 20-count tails. The total catch for 13 successful trawl hauls in 350 to 450 fathoms was slightly over 2,000 pounds. The largest single catch was 404 pounds. This species is presently fished only off West Africa by Spanish deep-sea trawlers. The Oregon has shown that there are also concentrations of this species on the western side of the Atlantic Ocean.

Optimism for Fishery

The staff of BCF's Pascagoula (Miss.) Exploratory Fishing Base will continue to improve deepwater fishing techniques. They are attempting to at least double the catch per unit time--and to encourage and assist U.S. fishermen to begin harvesting this species. These shrimp are a prized delicacy in Europe. Small quantities exported to the U.S. have brought premium prices. This suggests no difficulty in marketing future U.S. production.

Silt Is Major Killer of Young Oysters

BCF Milford (Conn.) Biological Laboratory's SCUBA examination of local oyster beds in early spring shows that many beds accumulate a sufficient layer of silt during the winter to bury many young oysters. On May 1, for example, on one bed of 1966-generation oysters, many oysters, mostly doubles and singles, were buried under as much as a half-inch of bottom material. Most were still alive; only 3.6% had died because of smothering.

Another bed with a heavy population of 1968 seed oysters also had accumulated a heavy layer of silt. By May 1, 14.9% of the spat already had been killed; by May 16, however, mortality on this lot had increased to 33.1%, probably due primarily to smothering by silt--but also partly due to predation by rock crabs.

On other beds, indicated mortalities due to suffocation by silt range as high as 40 to 50%, or higher. Much of this mortality can be avoided by transplanting the oysters to beds free of silt during March, or early April, while the oysters still are essentially dormant.

Project Launched to Aid Delaware River Oysters

The Delaware River Basin Commission has launched a research project to rescue the Bay's sagging oyster industry. It has contracted with the University of Delaware for a 4-year $100,000 research project to apply a successful Japanese production technique to the Delaware.

The Commission said that Japan has become a major oyster producer in the last quarter-century by growing shellfish suspended in water rather than on sea bottom. Previously, Japanese oyster production had dwindled drastically, as it has in the U.S. The U.S. annual crop dropped 50% in the last half-century.

Delaware's Oyster Industry

In recent years, the Commission noted, the Delaware oyster industry has been "racing toward extinction." Annual production fell from 4.2 million pounds in the 1950s to only 34,000 pounds a decade later.

Much of the drop is attributed to a predatory snail, the oyster drill. Scientists who designed the research project believe that taking oysters off the bottom, where snails live, will eliminate the problem.

Under the "off-bottom" system, young oysters are suspended from rafts in the bay on racks, in bags, or by stringing the shells.

Besides lifting the shellfish out of the oyster drill's reach, a principal advantage of the off-bottom system is the use of the full depth of water--compared to the limited space available on the bottom. Also, much of the bottom is not suitable for oysters.

The Research Project

The research will include the control of marine organisms that compete with oysters for food and growing space and a study of oyster growth; evaluation of the oyster's market value; the local economics of the off-bottom method and location of good growing sites in Delaware Bay.

If the off-bottom research project is successful, the knowledge gained will be turned over to commercial growers. In Japan, more than 90% of the oyster crop is produced by the off-bottom system.

An oyster research project conducted by BCF in Massachusetts showed that off-bottom oyster growth is twice as fast and far more productive than the conventional method.

Whaling Catch Regulations Published

BCF has announced regulations for the U.S. whaling industry in the North Pacific Ocean for the 1969 season. The regulations, which became effective upon publication in the May 29, 1969, issue of the "Federal Register," limit the U.S. catch to 48 fin whales and 60 sei whales.

The quotas were recommended by the Commissioners of the North Pacific member nations of the International Whaling Commission. Whaling Commissioners from the U.S.,

Japan, the USSR, and Canada agreed that it would be necessary to establish limits for their respective countries for the North Pacific for 1969.

Underwater Research Vehicle RUFAS Makes Debut

The remotely controlled underwater research vehicle named RUFAS, a cooperative effort of BCF's Pascagoula (Miss.) Base and the General Electric Co., Bay St. Louis, Miss., was scheduled to make its debut in June 1969. It will survey the Cape Kennedy calico scallop beds first delineated in the early 1960s by BCF.

Useful Tool

This equipment, designed to observe ocean-bottom conditions, makes it possible for scientists to predict availability, location, and patterns of scallop occurrences. Broader application of this new concept in fishery search and assessment will allow rapid and accurate visual evaluation of underwater objects, harvesting equipment, bottom topography, fauna, and flora. RUFAS is suited for monitoring many different subsurface biological activities.

The Vehicle

The Mark I model of RUFAS has an operational depth range to 300 feet at a 5-knot towing speed. It will have diving vanes controllable by cable from a tow vessel. This will enable it to dive, rise, and hold its altitude at any position above bottom. Underwater lights, vertical sounder for bottom reference, 16-mm. sequence camera, and underwater TV camera connected to a videotape recording system will be installed to provide visual-assessment capability.

Remote underwater fishery assessment system (RUFAS) developed at BCF Exploratory Fishing and Gear Research Base, Pascagoula, Miss., with General Electric engineers of Bay St. Louis, Miss.

Larval Tuna Fish Reared for First Time

Months of experimentation by scientists at BCF's Tropical Atlantic Biological Laboratory (TABL) on Virginia Key, Florida, culminated at the end of May in the rearing of larval tunas beyond the yolk sac from eggs collected in the ocean. The scientists believe it was the first time anywhere.

Dr. Carl J. Sindermann, laboratory director, said the achievement was a breakthrough in tuna research. He cautioned, however, that it was only the first of many steps before scientists will know whether tunas can be reared to adulthood under artificial circumstances.

Dr. Sindermann said: "The tunas are remarkably contradictory fish. They are among the most rugged of the pelagic fish while in the sea, but once captured are extremely delicate and must be handled with the utmost care." He noted that although a few species of marine fish have been cultivated successfully outside their natural habitat in recent years, the scombrids (tunas and tunalike fishes) have presented almost insurmountable problems.

The Tuna Eggs

The tuna eggs involved in the TABL experiment were collected off Miami Beach, Fla., by biologist Dr. Edward Houde in a mixed catch of plankton. At first, Dr. Houde knew that he had several hundred fish eggs--but did not know what species they were. The tuna eggs were about $\frac{1}{25}$ of an inch in diameter and were not easily separable from eggs of other fish species. He placed some eggs in a large (140-gallon) tank of seawater, others in a smaller tank that contained a large amount of green algae called Chlorella. The alga is believed to sustain the minute zooplankton (microscopic animals) fish larvae eat.

Tuna (little tuna or bonito) larvae reared from egg at BCF's Tropical Atlantic Biological Laboratory, Miami. ('Miami Herald')

The next day, about 200 hatchlings could be seen swimming around in the Chlorella-laden tank. Many larval fish subsist initially on their own yolk sacs. Most of the TABL larvae survived for almost 2 weeks, or about 10 days beyond the yolk-sac stage. By the 14th day, only 6 fish were still alive, but these were feeding actively on zooplankton. Meanwhile, Program Leader Dr. William J. Richards had definitely identified the tiny fish--about $\frac{1}{4}$ inch long, almost transparent, bearing large heads, large black eyes, and big jaws--as members of the "little tuna" group, Euthynnus alletteratus, in the Atlantic Ocean. These are commonly called "bonito" by Florida fishermen.

Larval fish seldom look anything like their parents until they reach the juvenile stage. This is judged to be about $\frac{3}{5}$ of an inch in the case of the little tunas in the TABL experiment.

Laboratory scientists believe the larval tunas finally died because of a series of maladjustments: water temperature was slightly lower than the 78.8 to 80.6° F. required, the light on the tanks should have been brighter, and more acceptable zooplankton food should have been provided.

Second Attempt Underway

After the first collection of eggs had hatched, Dr. Houde and his assistant, Barbara Palko, were able to distinguish tuna eggs from others in a batch collected on June 3. They claim that identifying marks were the size of the eggs, the faintly amber color of the oil globule, and the distribution of pigment on the embryo (all visible under a microscope). The two biologists used the same methods to hatch the second collection of 1,000 tuna eggs. All the eggs hatched, but most of the larvae survived for only 2 to 4 days beyond the yolk-sac stage. Thirteen days after hatching, 6 of the larvae were still alive and feeding on zooplankton, but then they also died--of unknown causes. Efforts will be made in continuing culturing experiments to determine just what combination of factors apparently conspire to cause, first, the high mortality of the newly hatched tunas and, second, the death at the end of about 2 weeks of the seemingly healthy survivors.

Dr. L. L. Glasgow Testifies on Pollution by Pesticides

Dr. Leslie L. Glasgow, Assistant Secretary for Fish and Wildlife, Parks, and Marine Resources, U.S. Department of the Interior, testified on the effects of pesticides on sport and commercial fisheries before the Subcommittee on Energy, Natural Resources, and Environment, Committee on Commerce of the U.S. Senate, May 19, 1969.

His statement follows:

We welcome the opportunity to comment on the effects of pesticides on sport and commercial fisheries because we are deeply concerned about the contamination of our environment by the use of pesticides. The recent discovery of high DDT residues in Lake Michigan coho salmon has brought the problem into national focus.

The current hearings in Wisconsin, sponsored by the Environmental Defense Fund and the Wisconsin Department of Natural Resources, have put pesticides on trial in that State. Hundreds of pages of testimony have been generated both for and against the continued use of DDT. Other States have taken actions to restrict DDT uses that have ranged from the elimination of certain use patterns to the outright ban of this chemical.

Lake Michigan Watershed

In addition to our own Departmental studies to develop information on the effects of pesticides in fish in Lake Michigan, we are working with other Federal agencies and the States to monitor the origin and the occurrence of pesticide residues in the Lake Michigan watershed. These collaborative activities will ensure the maximum utilization of talent and resources.

Sources of DDT in Lake Michigan have not been fully identified. DDT reaches the Lake from a variety of sources. More than 50 percent appears to come from urban uses where many factors contribute to the burden. A few of these are: control of Dutch Elm Disease, mosquito control, uses on home lawns and shrubbery, dry cleaning plants, wool treatment plants, sewage treatment facilities, and many more. We expect that the use of DDT in Michigan's fruit producing areas constitutes a potent agricultural source of this pesticide.

One objective of the Department of the Interior for all our water resources, for the Great Lakes and Lake Michigan, in particular, is to establish and preserve for future generations an environment that will produce healthy stocks of fish and wildlife. A major step in attaining this objective would be to stop the use of hard pesticides that are contributing to the contamination of Lake Michigan. The combination of physical and biological factors have made this body of water especially prone to pesticide pollution. While we recommend the elimination of persistent pesticides that contaminate the environment, we recognize that complete elimination at this time may not be practical or feasible. However, it is time to replace DDT with less hazardous pesticides. Continued use should not be permitted where environmental contamination occurs. Further, we should initiate the phasing out of other hard pesticides. They should be replaced by other less hazardous materials. We firmly believe that we should work toward this end; and that through cooperative efforts at all levels, solutions can be found to maintain both our food producing capability and an environment free from contamination.

Coho Salmon Seized

I would like to mention some of the pesticide problems that face our fisheries. The most dramatic are the economic implications of the seizure of coho salmon taken in Lake Michigan. The sport fishery on the Lake is valued at $200 million. Boats, tackle, motel rental and service industries have benefited enormously from the growth of salmon angling. The 1968 landed value of commercially caught coho salmon in the Lake was about $300,000. In that year, the Lake Michigan total commercial fish landings were valued at about $3 million. Under a recent ruling from the Food and Drug Administration, establishing DDT levels at 5 ppm in fish, these sport and commercial fisheries will be adversely affected.

The threat to the fishery resource through exposure to sub-lethal concentrations of pesticides is not nearly as striking as a major fish kill, but the effects of this exposure can be more significant. Existing evidence is adequate to demonstrate the relationship between present DDT levels in some fish and reproductive inhibition. Ten years ago in New York State trout in Lake George failed to reproduce because of DDT levels in the

eggs. We have evidence that a similar situation has occurred in sea trout in one of our estuaries.

Pesticides in Estuaries

The United States shrimp fishery is our most valuable fishery resource. Larval shrimp migrate in from the sea to the growing areas in our estuaries. We believe that the levels of pesticide pollution in the upper reaches of some estuaries of the United States are already so high that shrimp using them for nursery areas may be lost.

Since 1965, we have monitored the pesticide levels in our estuaries. Oysters and other mollusks are used as bioassay animals because of their efficiency in extracting and storing pesticides in their tissues. We have conducted over 6,000 analyses from about 170 stations, sampled monthly.

In general, all samples except those collected near the Canadian border show some degree of pesticide contamination, primarily, DDT. While none of the residue levels are high enough to constitute a human health problem, they could have a drastic effect on predatory animals in the estuary.

Pesticides Magnified in Food Chain

We also have evidence of secondary effects through magnification in the food chain. Pescide residues in fish are considered the most probable cause of the decline in hatching success in a colony of brown pelicans off the California coast this spring. Many nests contained eggs with collapsed, very thin shells. Experimental studies have shown that mallards fed DDT at low levels produce eggs with significantly thinner shells and hatch significantly fewer young than ducks fed untreated food.

Our evidence is increasing that persistent pesticides are hazardous to terrestial wildlife. It has long been established that the use of DDT to control Elm Bark Beetles results in accumulation of DDT in earthworms--many thousands of robins have been killed as a result of eating such contaminated worms.

Furthermore, we suspect that this type of pesticide treatment is responsible for the flushing of DDT into storm sewers and subsequent discharge into rivers and lakes.

Major River Systems Affected

The presence of DDT and dieldrin has been demonstrated in all major river systems of the country where it enters the aquatic food chain of many species of fish and wildlife.

Its subtle effect on reproduction and survival on many species of fish and wildlife are illustrated in the above-mentioned thinning of eggshells.

The Department of the Interior recognizes the complexities of pesticide pollution and, in cooperation with other Federal agencies and the States, has developed a monitoring program to identify the sources of contamination in the Lake Michigan watershed. The States have responded by curtailing the use of DDT in the watershed. At the Federal level, we are working with the Department of Agriculture to withdraw registration of hazardous-use patterns of persistent chlorinated hydrocarbon pesticides.

In 1963, the President's Science Advisory Committee recommended the orderly phasing out of organochlorine pesticides. The Department of the Interior supports this position and is currently programmed to bring it about on all lands administered by Interior agencies.

Fishery Legislation Proposed in Congress

CONGRESS SHOWS INTEREST IN "OUR NATION AND THE SEA"

On May 23, the President signed P.L. 91-15 continuing the National Council on Marine Resources and Engineering Development for one year, until June 30, 1970.

The Marine Resources and Engineering Development Act was enacted in June 1966. Its object was to develop, encourage, and maintain a coordinated, comprehensive, and long-range national program of marine science. It created a National Council of Marine Resources and Engineering Development, and a Commission on Marine Science, Engineering and Resources. The Commission was to make a final report in January 1969 and go out of existence 30 days later. Its report was titled: "Our Nation and the Sea." The Council was to expire on June 30, 1969.

One of the Commission's duties was to recommend a governmental organization plan and the estimated cost of it. This, with other Commission recommendations, was submitted to the President and Congress in early January. The report also contained 212 significant recommendations relating to many aspects of marine affairs.

The report of Chairman Garmatz, House Committee on Merchant Marine and Fisheries, stated: ". . . the fact, in view of the voluminous and comprehensive scope of the Commission's excellent report, that it is most unlikely that legislation establishing a new organizational structure for a national program in marine sciences can be enacted during the remainder of this fiscal year, it seemed . . . essential that the life of the Council should be extended for a reasonable period . . . to give Congress and the new administration a reasonable time to review and act upon the numerous recommendations."

Department of Marine Affairs

Already, the Commission's report has stirred several attempts to establish a Cabinet-level Department of Marine Affairs.

As early as January 16, Rep. Wilson, Calif., introduced a bill to establish a National Oceanographic Agency. Mr. Wilson commended the Commission's report for recognizing "the need for a coordinated attack on the unsolved problems of oceanography." He added: "We could make no better investment of the taxpayers' money than in oceanographic programs which will yield huge returns, provide greater understanding of our environment, and help further raise our national standard of living."

On March 25, Rep. Pepper, Fla., introduced H.R. 9482 to establish a Department of Oceanographic Services within the President's cabinet. This bill would coordinate and consolidate the major civilian marine functions of the Federal Government, enunciate national policies concerning the marine and maritime interests of the U.S., expand exploration of the sea, develop estuarine areas, and revitalize the U.S.-flag merchant marine.

On May 5, Rep. Anderson, Calif., introduced H.R. 10869 to establish a Cabinet-level Department of Maritime Affairs. He stated: "This bill would bring together and coordinate all U.S. commercial and governmental interests with respect to the sea."

On May 14, Rep. Dellenback, Oregon, introduced H.R. 11240 to establish the National Oceanic and Atmospheric Agency.

On May 20, Sen. Murphy, Calif., introduced S. 2204 to establish the National Oceanic Agency. It was cosponsored by Sens. Hatfield, Ore., and Tower, Tex.

Sen. Murphy said: "The truth is, however, that up to this time, we have only dipped into ocean exploration and development . . . the time has come when we must reorganize our Nation's oceanology program for the plunge . . . the time has come when oceanology must be given the priority it deserves."

The Subcommittee on Oceanography, House Committee on Merchant Marine and Fisheries, has been holding a series of hearings since April 29 on a national oceanographic program. The report of the Commission on Marine Science, Engineering and Resources has received much attention.

--Barbara Lundy

OCEANOGRAPHY

'GOFAR' Scientists Discover Salt Domes in Eastern Atlantic

Scientists of the U.S. Naval Oceanographic Office (NAVOCEANO) have discovered salt domes--geologic structures known to accumulate oil--in deep ocean sediment of the eastern Atlantic. Previously, these structures had been found only on continental-shelf areas, where petroleum companies now are concentrating all offshore drilling operations.

The discovery was reported to the recent convention of the American Association of Petroleum Geologists in Dallas, Texas, by Lt. Eric Schneider, a research geologist who heads the Global Ocean Floor Analysis and Research (GOFAR) project for NAVOCEANO.

May Affect Oil Searches

Lt. Schneider predicted: "The finding of domes along with organic-rich sediments (known to contain oil) may thrust the search for oil into the deep ocean areas. Our data show the domes to be located 400 miles west of Senegal and 180 miles north of the Cape Verde Islands (Africa)."

He said the GOFAR scientists believe the cone-shaped structures are salt domes because they have no magnetic signature--a test geologists use to identify sedimentary and igneous rock beneath the sea floor.

The structures appear to be pushing their way up out of the sediments underneath the sea floor; they also are located near "documented salt deposits on the Senegal continental shelf."

Data from USNS 'Kane'

The data were collected last summer when the USNS Kane, NAVOCEANO's most modern research ship, traveled 20,000 miles across the Atlantic from Bermuda to Liberia.

'GOFAR'

The GOFAR project is sponsored by the Navy. It is designed to increase man's understanding of the geological processes that formed and continue to mold the ocean floor.

Capt. T. K. Treadwell, NAVOCEANO Commander, explained: "The Oceanographic Office is interested in understanding these geological processes for the simple reason that it must provide the Navy and the marine community with accurate charts of the world's oceans. Regular soundings (depth measurements used to determine the topography of the ocean floor) are far more useful if we know the principles that determine the floor's features."

Coast & Geodetic Vessels Survey Alaskan Waters

Five U.S. Coast and Geodetic Survey ships are conducting extensive charting and ocean surveys in Alaskan waters this year. The 5 are: 'Fairweather,' 'Davidson,' 'Pathfinder,' 'Surveyor,' and 'McArthur'. Three ships left Seattle, Wash., their home port, in May; the remaining 2 were scheduled to sail in June. They will operate until fall.

The ships carry over 300 officers and crew and will collect information to benefit the increasing marine activity and economic development of Alaska's waterways. "Their survey data will be used for safe navigation of fishing and deep-draft cargo vessels, for locating oil-drilling sites, and for planning future mining, oil exploration, and waterfront construction."

The Plan

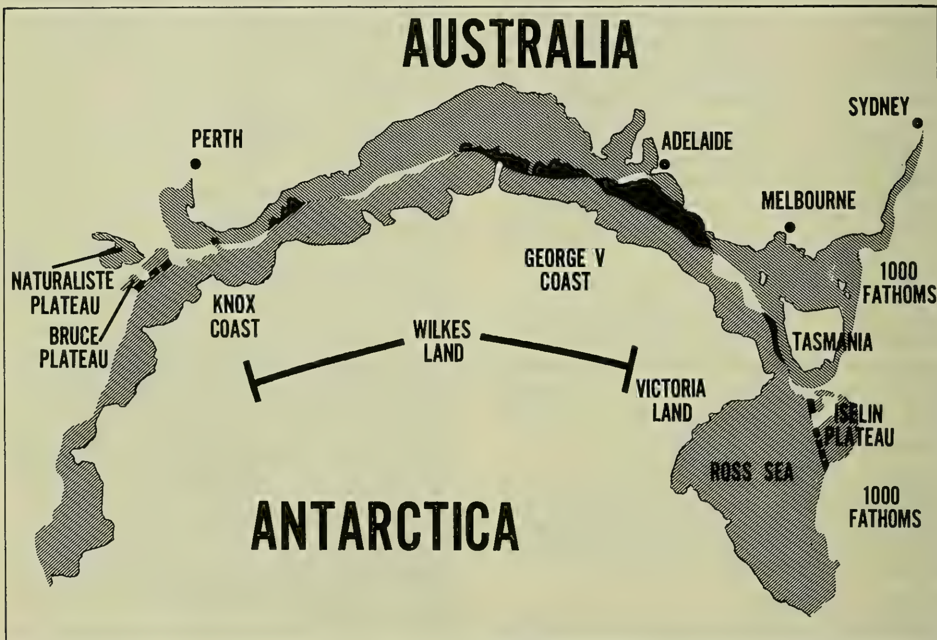
Four vessels will carry out hydrographic surveys several miles from shore. Their ship-based launches will determine depths in small inlets, bays, coves, and harbors. Their mission is to locate safe approach channels and anchorages; also, to determine the shallowest depth over navigational hazards, such as submerged rocks, shoals, reefs, and wrecks.

During winter, processing of survey data will begin for several new charts of the numerous sounds, bays, and harbors. Existing charts will be updated.

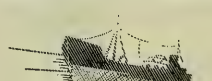
Australia and Antarctica Once Part of Supercontinent, U.S. Scientists Say

Two U.S. scientists report they have established that Australia and Antarctica, now separated by about 2,000 miles of water, were once part of an ancient supercontinent. The scientists, Walter Sproll and Dr. Robert S. Dietz, are geological oceanographers at ESSA's Atlantic Oceanographic Laboratories in Miami, Florida.

Sproll and Dietz processed oceanographic data obtained by U.S. and Australian scientists in 1967 during the global cruise of the 'Oceanographer.' The result, they say, was a "precise fit" between the 2 continents.



Drawing depicts how Australia and Antarctica were once part of an ancient supercontinent before it broke up and drifted apart 2,000 miles. Drawing is based on a computerized fit established by ESSA scientists from data obtained in 1967 by the U.S. Coast and Geodetic Survey Ship 'Oceanographer'. The diagonal lines represent the offshore underwater continental shelves of Australia and Antarctica; the solid black areas, the overlap of the two continents; and the white spaces, the underlaps.



U.S. Scientists Search Bottom of North Central Pacific

ESSA oceanographers have investigated 3 major underwater features to determine the history of the North Central Pacific basin. The study is part of a long-range program to unlock the secrets of the deep ocean.

The 3 features are: a newly discovered trough (the name "Emperor Trough" will be proposed); the Chinook Trough; and the Rat Island Fracture Zone(s).

ESSA explains: "Troughs are giant declivities in the ocean floor, while fracture zones are long bands where the sea bottom appears to have been broken, similar to the geologic faults found on land, such as the San Andreas Fault in California."

Project Purposes

The project was undertaken in April and May aboard ESSA's 'Surveyor'. The purposes were to determine the interrelationship of the 3 underwater features--and their relationship with the 'linear magnetic anomalies' found in the area. These anomalies are changes from the normal magnetic field observed on the earth's surface. They have been attributed to sea-floor spreading, a theory in which semimolten rock from the earth's interior rises and spreads laterally under the ocean floor. The theory ties in with that of continental drift. In this, the giant land masses are moved over the earth's surface. The magnetism in the semimolten rock is "locked in" when it cools. It furnishes a record of the distance it has traveled since it rose from great depth. The magnetized rock can be detected on the sea surface by ship-towed instruments.

Emperor Trough

The northwest-trending Emperor Trough was discovered in 1968 by scientists of ESSA's Pacific Oceanographic Research Laboratory in Seattle, Wash. They used data gathered principally by the Surveyor. The trough runs at a 40° angle to the Emperor Seamount Chain, a range of submerged mountains. "Data on the depth, width, and length of the Emperor Trough are expected to be made public shortly."

The Emperor Trough appears to be the northeastern boundary of the Mellish Rise. The latter is an elevation in the ocean bed lying east of the Emperor Seamount Chain. The chain runs north and south from near the western tip of the Aleutian Islands until it meanders south-southwest; it terminates west of Midway Island in the Central North Pacific.

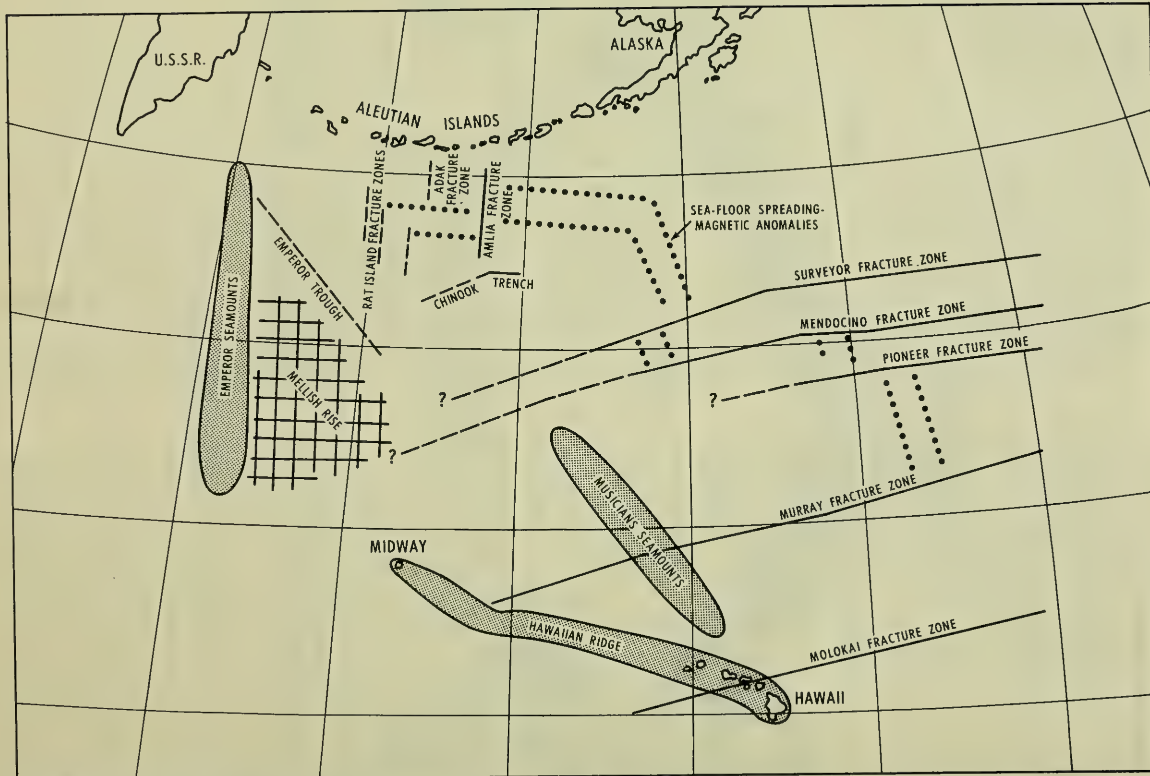
The Mellish Rise is a feature about 800 or 900 miles across. It is elevated about one mile above the average ocean depth. Its depth is still more than 3 miles below the ocean's surface.

Chinook Trough

Only part of the Chinook Trough has been surveyed. It lies east of the Emperor Trough and apparently swings in a southwest direction. One project aim was to discover whether the 2 troughs intersected and, if so, the structural relationship between them.

Rat Island Fracture Zone(s)

The Rat Island Fracture Zone(s)--oceanographers do not know how many there are--is near the westernmost extent of the eastern Pacific sea-floor-spreading anomalies. It appears to be either a series of angular fractures or a single northwest-trending structure. (See map on following page.)



Topography of North Pacific sea bottom where oceanographers aboard the U.S. Coast & Geodetic Survey Ship Surveyor recently conducted studies aimed at determining the history of this vast underwater region. Question marks at various fracture zones indicate their extent has not yet been determined.

Foreign Fishing Off U.S. in April

NORTHWEST ATLANTIC

April's good weather allowed uninterrupted surveillance from south of Nova Scotia to Cape Hatteras, N. Carolina; 237 vessels were sighted. In March 1969, there were 218.

Most were Soviet--30 factory stern trawlers, 131 medium side trawlers, 6 factory base ships, 4 refrigerated transports, 1 tug, and 1 tanker. (In April 1968, 188 had been sighted.)

Off Southern New England & Georges Bank

Soviet: Since January 1969, 15-20 stern trawlers had fished (mostly red hake) south of Block Island towards Nantucket. After moving off the Virginia Capes for a short time, they shifted early in April to the vicinity of Hudson Canyon. No catches were observed.

By mid-month, 25-30 side trawlers were south of Martha's Vineyard and Nantucket. Catches were mostly herring. Earlier, some of these trawlers had fished off Virginia and North Carolina.

Many Soviet vessels were sighted on Georges Bank in late April for the first time in 1969. From 20 to 25 stern trawlers fished in 75-100 fathoms along the eastern slopes, between Lydonia and Corsair Canyons. No catches were observed. (At that depth they may have been seeking whiting.)

Off Mid-Atlantic States

Soviet: Over 100 vessels fished off the mid-Atlantic coast throughout the month. This fleet showed surprising mobility: it shifted north and south several times in one week. At end of March, it was off the entrance to Chesapeake Bay. During first week in April, it shifted north off Delaware Bay, returned off Chesapeake entrance, and finally moved south off North Carolina.

On April 9 and 10, 107 medium side trawlers and 7 support vessels were in a 25-mile area, about 25-30 miles east of Currituck Sound, N.C. Moderate catches were mostly herring. A few vessels were scattered north of the fleet. On the same dates, 15 vessels (mostly stern trawlers) were in 2 groups, 30 miles south of Long Island and 60 miles east of New Jersey. No catches were observed.

By mid-month, an estimated 100 vessels (mostly side trawlers) had concentrated in a 15-mile area, 50 to 60 miles southeast of Cape May, N.J. A small group was south of Moriches, L.I. Catches were mostly herring. (In April 1968, 75-100 vessels had fished herring 40-60 miles south of Moriches.)

From the third week, the main concentration was in a 20-mile area, 65 miles south of Shinnecock, Long Island (north of Hudson Canyon). Heavy to moderate catches of herring were observed. A group of 25 vessels was widely scattered from east of Atlantic City to southeast of Cape May. Several stern trawlers had catches of red hake on deck.

Polish: Two factory stern trawlers, 28 large side trawlers, and 2 factory base ships were sighted.

Before mid-month, 20 to 25 vessels were 40 miles east to 60 miles southeast of Cape May. Moderate catches were mostly herring and some mackerel. After mid-month, about 25 dispersed off New Jersey, east of Barnegat Lightship to southeast of Cape May. Catches were mostly herring. (In April 1968, 25-30 vessels had fished off New York and New Jersey.)

Japanese: Ten stern trawlers were sighted, the largest number ever observed fishing off the U.S. Atlantic coast. They operated along the 50-100 fathom edge, from south of Martha's Vineyard to the southwest slopes of Georges Bank. Catches appeared to be whiting. All vessels had hydrophones hung from booms on the port side. Hydrophones are part of a recording system indicating trawl behavior (depth, etc.).

Spanish: Twenty pair trawlers fished from the Northeast Peak of Georges Bank to Brown Bank. Several had fair catches of cod on deck.

East German: Late in April, 2 side trawlers were 60 miles south of Martha's Vineyard. No catches were observed. (In April 1968, 3 side trawlers had fished herring 17-20 miles south of Shinnecock Inlet, L.I.)

U.S.-USSR Mid-Atlantic Fisheries Agreement

The 'no fishing zone' restrictions ended on April 1. No Soviet support activities were observed in the loading zones.

On April 11, a 6-man U.S. team visited the Soviet Fishing Fleet Commander aboard the 'Robert Eihe,' about 50 miles off Norfolk, Va.

Polish Vessel Enters Port

On April 12, the Polish factory base ship 'Pomorze' entered the port of Philadelphia, Pa., to take on fresh water and small amounts of food and fuel. She had only a small cargo of frozen and bulk salted herring on board.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign vessels were reported fishing in April 1969.

OFF CALIFORNIA

Soviet: Four side trawlers, 14 stern trawlers, and 3 support vessels fished west of San Francisco, stretching 80 miles north and south. Pacific hake, rockfish, red snapper and black snapper catches were observed. (About the same number had fished here in April 1968. Many were the same.)

OFF PACIFIC NORTHWEST

Soviet: Seven stern trawlers, 13 side trawlers, and 5 support vessels were sighted. Except for 1 support vessel, all were off Oregon. (In April 1968, 54 Soviet fishing vessels had been sighted.)

After mid-April, 1 stern trawler was observed with her deck bins filled with Pacific hake. Towards the end of the month, side trawlers took large quantities of hake. Some, fishing in pairs, landed an estimated 40,000 to 50,000 pounds for each tow. Individual side trawlers tows were estimated at 20,000 to 30,000 pounds.

Japanese: One longliner was sighted off Oregon. On one occasion, the catch observed was almost entirely black cod, with a few red snappers. (One stern trawler and 1 support vessel had been in the vicinity in 1968.)

OFF ALASKA

Soviet: The 165 vessels sighted at end of March dropped to 82 by end of April. In April 1968, 70 had been sighted. This year's increase is largely attributable to a second shrimp fishing fleet in the Gulf of Alaska--and to a continued herring and flounder fishery in eastern and central Bering Sea.

The decline in vessels fishing flounder began in early April but, unlike previous years, withdrawals halted in mid-month. About 15 medium trawlers and 5 support vessels remained along the Continental Shelf edge south of the Pribilofs, a favored Alaska pollock fishing area. Sightings indicated that fishing had shifted from flounder to pollock.

Herring fishing was sporadic. At month's end, only 5 medium trawlers and 1 processing refrigerator remained, north and west of the Pribilofs, in central Bering Sea.

The deep-water trawl groundfish fishery, along the Shelf edge in eastern Bering Sea, was abandoned in early April. The vessels transferred to the shrimp fishery in the Gulf. Late in the month, 2 medium trawlers resumed the groundfish fishery along the Shelf edge, west of the Pribilofs.

Two factoryships and 8 tangle net-setting trawlers fished crab north of the Alaska Peninsula. This year, as in 1968, most Soviet catches were tanner rather than king crab.

Fig. 1 - 'Pavel Chebotnyagin,' factory ship, receives picker boats with loads of tanner crab.

One shrimp fishing fleet--15 medium trawlers and 2 factoryships--remained on Portlock Bank, east of Kodiak Island. In early April, a second shrimp fleet--1 canning

Fig. 2 - Factory ship 'V. Putintsev,' nested with refrigerated transport 'Visili Perov,' and SRTM 8-407 alongside, on shrimp grounds. (Photos: Branson)

factoryship and 6 medium trawlers--began fishing near the Shumagins, in the western Gulf. This was the first time the Soviets had fished shrimp near the Shumagins since the U.S. contiguous fishery zone was effected in March 1967.

Japanese: Fishing effort--125 to 130 vessels--remained relatively stable.

About 5 stern trawlers fished ocean perch along the Shelf edge, principally in the eastern Gulf. This was the only known Japanese ocean perch fishery in the Alaska region.

Ten stern trawlers, 2 medium trawlers, and 1 refrigerated transport fished herring in central Bering Sea during first 2 weeks of April. Then, much like the Soviets, the Japanese reduced effort, and withdrew from the fishery during the third week.

About 4 stern trawlers fishing groundfish along the Shelf edge, in eastern and central Bering Sea, had increased to 10 and 1 refrigerated transport by month's end. The additional vessels had come from the abandoned herring fishery. Catches, mostly pollock, included small amounts of sablefish, arrowtooth flounder, and ocean perch.

Three minced meat and meal factoryship fleets remained along the Shelf edge, north of the Fox Islands in the eastern Aleutinas, through mid-month. In late April, they moved north onto the Shelf, northeast of Unimak Is. At month's end, a fourth fleet of about 15 vessels was nearing the eastern Bering Sea fishing grounds.

Two factoryships, with 30 tangle-net and pot-fishing trawlers, fished tanner and king crab north of the Alaska Peninsula. As before, Japanese crab vessels often mingled with their Soviet counterparts.

Three to 5 longliners fished sablefish in the Gulf off southeastern Alaska. In late April, 2 longliners were north of Fox Is. in eastern Aleutians. A third was along the Shelf edge west of Pribilofs. Eastern Bering Sea catches appeared to be sablefish.

South Korean: One stern trawler fished along the Shelf edge in the eastern Bering Sea, from west of the Pribilofs to near Unimak Pass. This same trawler made at least 2 trips to the eastern Bering Sea last year.

STATES

New York

REEF FISH STUDY BEGINS THIS SUMMER

During summer 1969, the New York State Conservation Department will start an extensive, long-range study of the fish populations of artificial reefs. The Department says little is known of these fish in northern waters. It is seeking information on kinds of reef fishes and their life stages spent there. This information is necessary to manage these fishery resources properly.

Reefs Selected

The reefs selected are the inshore reef in Great South Bay near Saltaire and the offshore reef near Fire Island Inlet. Sampling locations will be marked with red and white marker buoys.

The Study

The study will include general life history, movement, and population of sea bass and blackfish (tautog). Both will be tagged either with red and white Petersen Disk tags, or a new type of colored plastic streamer.

There will be a $1 reward for returning a tag. The public is asked to send both disks, if that type is used, or entire plastic streamer with where, how, and date fish was caught to: New York State Conservation Department, Setauket, New York 11785.

* * *

WATER-POLLUTION RESEARCH CENTER SET UP BY 9 COLLEGES

Nine colleges and universities in the New York metropolitan area are working together to organize an oceanographic research center at Montauk, the easternmost tip of Long Island. The center will seek solutions to pollution problems in the waters around Long Island. The 9 institutions have leased the buildings formerly housing the testing facilities of the Republic Aviation Corp. These will be converted to marine laboratories this summer.

The 9 are Adelphi, Dowling, Fordham, Hofstra, L. I., N. Y. Institute of Technology, New York University, St. John's, and the State University of N. Y. The new center also will coordinate the marine research now being done independently by the 9 schools.

Isolate Pollutants First

Dr. James Alexander, acting director, said the first research project would be to isolate the compounds polluting Long Island waters. He added: "Pollution is Long Island's main problem. Our aim will be to find out how the ecology has been affected."

Visiting professors and graduate students will study first pollution's effects on such microorganisms as plankton.

Alaska

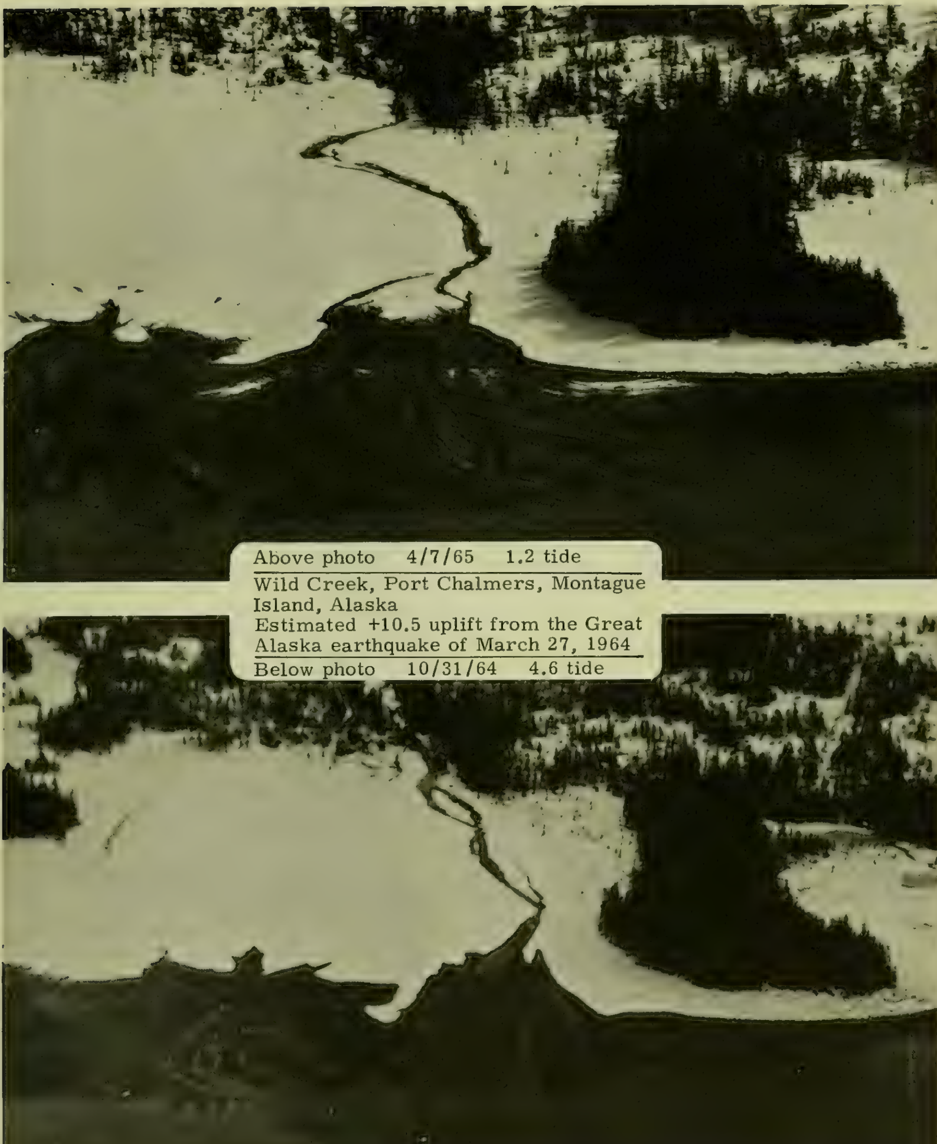
SEEKS U.S. FUNDS FOR EARTHQUAKE-CAUSED SALMON DISASTER

The Prince William Sound salmon fishery suffered a disastrous decline as a result of the March 1964 earthquake. The earthquake centered in this area. Land mass subsidence in parts of Prince William Sound caused loss of spawning grounds. These are covered with salt water. In other areas, the land mass was uplifted. This caused instability and erosion of spawning beds. The result is a substantial decline of salmon runs throughout Prince William Sound.

Montague Island Hard Hit

The situation is particularly serious on Montague Island. The island was tilted upward 8 feet at its northeast end and 35 feet at the southwest. Before the earthquake, Montague Island salmon runs were about 700,000 each year; only 20,000 are expected for 1969.

The Alaska Department of Fish and Game has requested the Secretary of the Interior to find the Prince William Sound salmon fishery a fishery disaster under Public Law 88-309. The finding would permit 100% Federal funding for fishery restoration projects. State and Federal personnel are cooperating to prepare a proposal for rehabilitation and restocking of certain Montague Island streams.



Aerial photographs showing overwinter changes in the channel of Wild Creek which illustrate extreme instability following the Alaska earthquake. Most streams in Prince William Sound in areas uplifted 6 feet or more displayed similar action. (Photos: Jerre Olson)

California

Will The Shrimp Boats Keep A Comin'?

W. A. Dahlstrom and D. W. Gotshall

The quota system applied to California's ocean shrimp fishery has enabled this infant industry to grow to lusty maturity in less than two decades. From a modest beginning of 206,107 pounds landed in 1952, the first year of the fishery, landings hit a new high of 2,272,545 pounds in 1968. The question is, will it always be that way?

The answer is a qualified yes. The ocean shrimp fishery can prove stable and profitable for many years to come, with one provision. The quota system must be strictly adhered to, or the fishery could disappear in a single season.

Two other questions might be, "How and why are quotas set," and "Why is this fishery so susceptible to overfishing?" Both good questions, but before we answer them, let's review the history of the ocean shrimp fishery.

California Ocean Shrimp

Prior to 1952, it was a latent, unutilized resource. The groundwork for utilizing this resource was carried on by marine biologists of the California Department of Fish and Game.

During some of the bottom fish investigations conducted by the Department before 1950, occasional net hauls contained numerous shrimp. With these encouraging signs and the hope of developing a new resource, a scouting plan was designed to determine the location and extent of our shrimp beds.

During 1950 and 1951, exploratory fishing was conducted from the Department research vessel 'N.B. Scofield'. Tows were made over the areas where shrimp had been found and over areas where the bottom and depth appeared suitable for shrimp.

From exploratory fishing and data received from commercial fishermen, we learned that ocean shrimp are always found in association with green mud bottoms. This does not mean, however, that there are shrimp wherever there is green mud. Some unknown factors are involved because shrimp concentrations large enough to support commercial fishing are not found on all of the green mud areas located off California.

As a result of the 1950-51 search, five dense concentrations of ocean shrimp were charted along the California coast.

Areas Established

In 1951 the California State Legislature enacted laws empowering the Fish and Game Commission to regulate the new ocean shrimp fishery. The area of the shrimp beds and the abundance of shrimp on them were used as a basis to designate three fishing areas, each with a specified limit or quota. By 1956 it had become apparent that a portion of one of these areas (B) was not being fully utilized. Therefore it was divided and the two shrimping areas formed were allotted separate quotas. The four designated shrimping areas along the California coast are:

Area A, from the Oregon-California border to False Cape;

Area B-1, False Cape to Pt. Arena;

Area B-2, Pt. Arena to Pigeon Pt.;

Area C, Pigeon Pt. to the Mexican border.

Statewide landings in the first year of the fishery, 1952, were 206,107 pounds. They climbed steadily to peaks of 2,006,274 pounds in 1960 and 2,095,278 pounds in 1963. Landings fluctuated between 980,608 pounds and 1,425,875 pounds from 1964 to 1967 because of lower shrimp abundance, reduced quotas in Area "A", and little or no harvest from Areas "B-1", "B-2", and "C".

The all time high of 2,272,545 pounds landed in 1968 was made possible because of shrimp abundance, an increased quota in Area "A", and landings of 191,925 pounds in

The authors are Marine Biologists, California Department of Fish and Game.
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Area "B-2". After initial landings of about 200,000 pounds each year during 1952 and 1953 in Area "C", Area "A" became the principal area of production and has remained the top producer since then.

Statewide landings have average 1,699,734 pounds annually over the past 10 years. The 10 years of shrimping have brought approximately $1,800,000 to the state's fishermen. Last season's record catch of 2,272,545 pounds was worth approximately $270,000 to the fishermen.

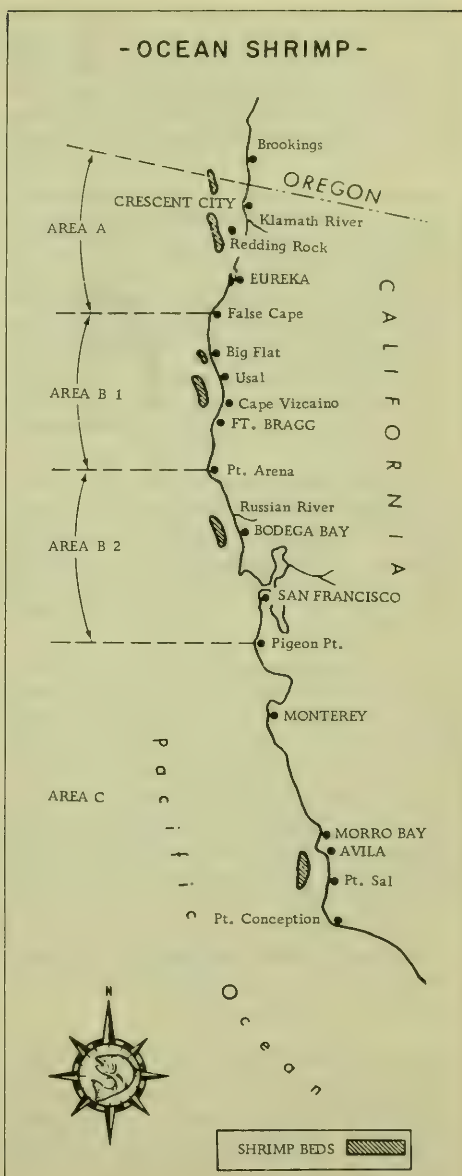
Statewide Landings - Ocean Shrimp

Year	Pounds Landed
1952	206,107
1953	295,524
1954	299,768
1955	847,062
1956	1,170,074
1957	1,425,631
1958	1,730,222
1959	1,785,228
1960	2,026,787
1961	2,006,274
1962	1,786,289
1963	2,095,278
1964	980,608
1965	1,425,875
1966	1,213,959
1967	1,404,821
1968	2,272,545

Population Characteristics

The ocean shrimp has the scientific name of Pandalus jordani and is actually a small prawn--small enough so that it falls into a size commonly marketed as shrimp. Heads-on counts per pound range from about 70 to 160, and average about 100 per pound.

Shrimp beds do not have stable populations as evidenced by the failure of the fisheries in Area "B-1", "B-2", and "C". Landings in Area "C" (Morro Bay) have virtually ceased since 1953 because the fishermen have not been able to find the shrimp in commercial quantity. The fishery in Area "B-2" (Bodega Bay) also declined after six years of fishing from 1953 to 1958. Landings have been sporadic and some years fishermen are unable to find the shrimp in commercial quantity.



The fate of the Area "B-1" (Fort Bragg) fishery took a similar course. After five years of fishing from 1957 to 1961 with peak landings of 797,000 pounds in 1961, the fishery collapsed and little or no landings have been made since. The highest catch rate was made in 1961 with an average catch per hour of 952 pounds.

Efforts by fishermen and surveys by the Department from time to time in those areas other than "A" have usually not located commercial quantities of shrimp. The harvest by the fishery in Area "A" may have been relatively stable but the shrimp population was not. Strong and also weak year classes in the population have been determined from the data obtained during the research cruises and by sampling the commercial catch. The population will surge up and down depending upon the numbers of new shrimp or recruits entering the shrimp resource.

The shrimp population in Area "A" is composed mostly of one and two year old shrimp. Very few shrimp live to be three years old and as far as we know, no shrimp live longer than four years in California waters. Since 1964, recruitment has been good every other year. The 1964 year class as well as the 1966 were strong.

A post-season survey completed in September 1968, also reveals that the 1968 year class is strong. Unfortunately the 1965 and 1967 year classes were relatively weak, so the fishery had to rely on each strong year class for two successive years. However, this did result in larger shrimp during the second year of the year class in the fishery. The pattern of strong recruitment every two years was evident in 1959 and also in 1961. However, this did not occur in 1963. The population swung into strong even year recruitment in 1964.

Since the harvested shrimp are so young, many are caught before they have a chance to spawn. It takes them about $1\frac{1}{2}$ years to become sexually mature.

Life history studies of this species have revealed some amazing characteristics. The normal pattern is for the shrimp to function as a male first when between one and two years old, then go through several transitional phases and then become a female when between two and three years old.

During strong recruitment years, however, it has been observed that many shrimp, as high as 70 percent of a year class, will start changing sex to females between one and two years old and will not function as males. This occurred in 1967 and resulted in a strong 1968 year class.

Range

The range of this species is from Unalaska to San Diego. They appear to have a maximum density off central Oregon. Area "A" is the California bed closest to the area of maximum density. Our other shrimping areas are further away and never have had the potential of Area "A". Initial surveys of the areas in 1950 and 1951 revealed a much larger population in Area "A" than in either Areas "B" or "C". Therefore, the original quotas were set at 1,500,000 pounds in Area "A", 400,000 in Area "B", and 200,000 pounds in Area "C". The Area "B" resource comprised one bed off Bodega Bay and one off Ft. Bragg.

We believe that it is not possible to have stable populations in Areas "B-1", "B-2" and "C" because of the fact that species on the extremities of their range are known to fluctuate widely and our observations indicate that the populations have been relatively small and do not have large potential. Even in the absence of fishing or with limited fishing, the resource has not returned to its former level of abundance in these areas.

Natural mortality is high and probably a good portion of this is caused by predator fishes. Fishing no doubt contributed its share to upset the delicate balance between recruitment and mortality and send the populations down to low abundance levels. Although shrimp still remained in the areas, the populations were reduced to a point where it became uneconomical to catch them.

The populations in these areas remain at a low level and only in Area "B-2" does the population occasionally make a slight comeback. Usually this is because a new year class enters the population but its potential is limited and provides only a fishery of about one season's duration. This occurred in 1962, 1963, 1965, and 1968 when landings ranging from 180,000 to 250,000 pounds were made.

Estimating Population

How do we determine the number and pounds of shrimp on a particular bed? Since 1960 we have used our research vessels, the 'N. B. Scofield' and 'Alaska', to survey the beds. Two surveys were made each year, one prior to the opening of the season and the second in the fall after fishing had ceased.. Until 1965, a shrimp net was towed in areas where shrimp were concentrated and also outside of the concentrations to determine total area and abundance.

In 1965 we changed our survey methods in an attempt to improve our estimates. Area "A" was selected for a three-year intensified study.

First we compiled all information from fishermen's records and our research cruises to determine the area where concentrations of shrimp had been found since 1951. The resulting survey area, covering 270 square miles, was divided into sub-areas based on where shrimp concentrations tended to be more uniform through the years.

Next, our statisticians were given the task of setting up a random survey plan that would yield reliable estimates from the limited number of days that the research vessel was available.

The sampling system which was designed by these specialists involved several complex statistical formulas and the use of computers to calculate the estimates. We have used this survey plan since March 1965 in Area "A".

During the last four years, marine biologists have spent 205 days at sea and have made 1,188 tows. After a survey was complete, the data was fed into a computer, which in turn calculated the average number of shrimp per tow. A calculation was then made to determine how many possible tows $\frac{1}{2}$ mile in length could be made in the survey area. The total estimated population was then calculated by multiplying the average number of shrimp per tow by the total number of possible tows.

Mortality Rates

One of the most important facts we need to know about any fish population is the mortality rate. The end product of all our research, no matter what species, is to be able to predict the optimum harvest that a population of a marine species can yield and still maintain itself.

Mortality rates play an extremely important role in the complicated calculations involved in arriving at how many shrimp can be harvested each year.

All shrimp die either from fishing or from natural causes, such as being eaten by predators. We use population estimates to calculate mortality rates. In simplest terms, the annual mortality rate is the percentage of shrimp that die during the year. We can separate the percentage killed by fishing from the percentage killed by natural factors, simply by determining the percent of the population that dies naturally during the season and also during the winter, when no fishing is taking place.

This natural mortality rate for shrimp varies depending on the age of the shrimp. During their first year of life, approximately 67 percent of the shrimp die from natural causes; about 50 percent of the survivors die from these causes during the second year, and at least 75 percent of the population dies during the third year.

Thus, in order to have enough spawning shrimp in the fall, we must leave enough shrimp at the end of fishing to make up for the numbers that will die naturally. The earlier the quota is reached, the more shrimp we need.

Let's consider the effects of predators on the shrimp population. We have found that Pacific hake feed heavily on shrimp. We have also found that if we examine enough hake stomachs we can determine the percentage of one, two, and three year old shrimp in the population. To put it another way, it appears that we may be able to use Pacific hake as "finny" marine biologists to help collect data on the shrimp population.

Quotas

The bag limit or quota on a particular fishery is designed to provide a continuing and safe level of harvest. In other words, the Department of Fish and Game shrimp research program has been trying to prevent a "boom and bust" fishery. The boom and bust fishery is best exemplified by the sardine fishery.

Each California shrimp bed has a separate quota. The quotas from 1952 through 1960 were based on harvesting 25 per cent of the estimated population. Landings and catch rate per hour were also used as guidelines. Areas "B-1", "B-2", and "C" have had a minimum quota of 250,000 pounds since the year each Area failed.

A decline in the northern California shrimp population (Area "A") in 1964 prompted Department biologists to examine other methods for setting the quota for that area. The biologists found that there seemed to be a relationship between the number of females left at the end of the commercial fishery in the fall and the number of one year old shrimp produced by these females.

In 1965 the quota for Area "A" was set to allow a minimum of 300,000,000 females to survive and spawn. These females produced an estimated 1,800,000,000 one year old shrimp, or six young shrimp for every spawning female. In the fall of 1966 a spawning population of 150,000,000 females produced approximately 400 million one year old shrimp, or slightly less than a 3 to 1 increase.

The one year olds produced by the 300 million females supported the fishery during 1967 and 1968; in fact the 1968 California catch was the largest ever landed from Area A.

Thus we learned that we had to leave a sufficient spawning stock for continued reproduction.

The quota for Area "A" is determined during the winter, following a fall research cruise. From the cruise data, the biologist in charge at Eureka determines the number of shrimp that will be on the bed when the season opens the following spring, and then calculates how many pounds of shrimp can be harvested and still leave enough females for spawning in the fall. The fall population estimate and our calculated mortality rates are used to make these predictions.

The recommendations are sent through staff to the Director. After review, the Director makes a recommendation to the Fish and Game Commission which in turn establishes a quota, during a public meeting, for the coming season. At this time shrimp fishermen and processors have an opportunity to make their own recommendations to the commission concerning the quota.

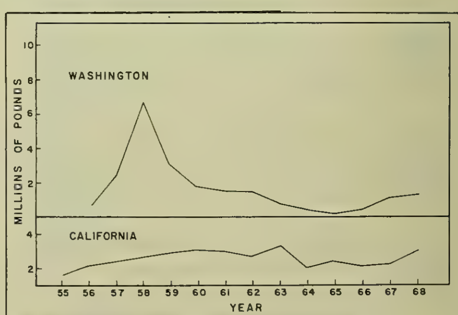
Why Conservative

When quotas were originally established in 1952, it was realized that the areas had limited potential. These quotas based on one-fourth of the total population would serve as a stepping stone to increase or decrease the quotas depending upon the change of abundance of the shrimp in each area.

Initially the small quotas were attained and shortly thereafter the fisheries declined. Area "A", however, has continued on a sustained yield basis since inception of the fishery in 1952.

If overfishing takes place in this area, we believe events will follow the pattern of the other areas in California and that an industry based on shrimp in California will be virtually non-existent. The backbone of the California shrimp landings has been the Area "A" bed and we believe that through the flexible use of a quota system the resource has been able to sustain itself.

A good example of the tragic consequences of overfishing can be provided by what happened in the State of Washington. With unrestricted fishing, landings peaked at 6.4 million pounds in two years (1968). Since then, there has been a steady decline in effort and landings, and during 1964, 1965, and 1966, virtually nothing was landed.



Apparently this same thing happened within California's Area "B" and "C" beds. Area C off Morro Bay peaked during 1953 with landings of 200,000 pounds. In 1954 less than 10,000 pounds were landed. Peak landings occurred during 1957, 1963, 1965 in Area B-2. In 1961, 800,000 pounds were landed from Area B-1; the following season saw landings drop off to 250 pounds.

Importance of Fishery

What would happen to the economy of the north coast regions of Eureka and Crescent City if the Area "A" shrimp bed failed? The first noticeable effect would be reduced summer employment. Shrimp processing in Eureka and Crescent City now employs between 400 and 500 persons each summer. A large number of these workers are high school students. In many cases this is the only employment open to these students.

The economic value to the 30 to 45 fishermen who participate in the fishery must also be considered. These fishermen have received an average of $180,000 annually for the past 10 years. We estimate from the wholesale price of shrimp, that the Area "A" shrimp fishery in the past 10 years has contributed an average of $600,000 annually to the north coast economy.

Evidently the fishermen are prospering from the shrimp fishery and other fisheries they pursue during the year. Five new boats, 50 to 60 feet in length, have been built and have been or will be involved in the shrimp fishery.

Crescent City is in the process of building two new fish processing plants. The success of the companies that will operate these plants will depend in part upon the shrimp landings.

It would be tragic to see the shrimp industry fail because of lack of shrimp. The Monterey sardine industry remains as a powerful example of what can happen when an important fishery fails. Empty and abandoned canneries, rusting equipment, and large purse seiners slowly going to pieces from disuse are constant reminders of what can happen when an "inexhaustable" supply of fish suddenly vanishes.

Future

What about the future of the ocean shrimp resource? We are convinced that California can maintain a healthy fishery for future generations. The continued sustained yield of Area "A" since 1952 speaks for itself. The key to the future of California's ocean shrimp industry is in Area "A". Our statisticians have calculated that Area "A" can safely harvest 1.5 to 2.0 million pounds each year. In some years greater harvests may become possible.

Efforts will be made to work out a joint management plan with the State of Oregon for management of the Area "A" shrimp population because vessels operating out of Brookings, Oregon, also fish the same area and harvest from the same population.

For California to have a continued stable fishery, a quota system is necessary. The cooperation and understanding of the members of the Department of Fish and Game, the Fish and Game Commission and the members of shrimp industry are the essential ingredients. If this resource is properly managed, it can continue to produce savory shrimp cocktails and Louis for many years to come.

* * *

ANCHOVY LANDINGS FAR EXCEED LAST SEASON'S

California landings of anchovies for reduction were estimated at 27,246 tons for the 1968/69 season, the California Department of Fish and Game (DFG) reported May 24. The quota for the season that ended May 15 was 75,000 tons. Landings were much greater than the previous season's, when there was little fishing and the total was 6,505 tons.

In the Northern Permit Area, with a quota of 10,000 tons, landings were 2,736 tons. The 5 zones of the Southern Permit Area had landings of 24,510 tons. The bulk of landings--12,046 tons--were in offshore Zone V. Zone II, Point Hueneme to Point Vicente, and Zone III, Point Vicente to Dana Point, attained quotas of 5,000 tons before end of season and were closed.

Insufficient Plant Capacity

DFG said southern fleet remained active until season's end. But considerable time was lost because vessels were unable to unload for lack of sufficient plant holding and processing capacity. State, Federal, and university biologists have estimated the anchovy population in California waters at a minimum of 2 million tons.

Anchovies taken in the reduction fishery are processed into oil and fish meal for poultry and livestock feed, also used as bait and for canning.

Study Anchovy Population

DFG noted that anchovy population studies are continuing. During April, 10,000 anchovies were tagged in Ensenada; the total tagged now is 380,719. Tag recoveries for April were 55, and 42 in May; total recoveries are 965.

The latest tag recoveries bolster earlier data showing a strong north-to-south movement and an exchange of fish between major fishing areas in Southern and Central California.

Florida

GOV. KIRK SIGNS AQUACULTURE BILL

On June 4, Gov. Claude R. Kirk Jr. signed into law an aquaculture bill permitting the private leasing of waters overlying state-owned land. The act provides the legal structure for leasing the waters to develop domestic seafarming of oysters, shrimp, pompano, catfish, and other fresh and saltwater seafoods.

The governor said: "This bill provides for the creation of a good, clean industry which may very well become the most important in Florida and, indeed, the world. Florida has more coastal waters than any other state. With the advent of domestic seafarming under this bill, we may very well become the leader in feeding the starving peoples of the world. Within a period of 24 months more than $150 million will be invested in Florida aquaculture under this bill. Industry has hesitated coming in to Florida because we had no specific law. We had 42 companies expressing an interest in investing in aquaculture here, and now we expect them to move in."

Texas

ELECTRIC BROODER
FREES MALE CATFISH

Male channel catfish at the Texas Parks and Wildlife Department's San Marcos fish hatchery now have more leisure time. They don't have to "egg sit" anymore--the whole process has been automated.

Until now it has been the practice of male catfish to herd the female toward the nest, fertilize the eggs and then chase the female from the area since females are notoriously cannibalistic toward their offspring.

The male would then tend the eggs during the seven-day incubation period, fanning the nest with his tail to keep the water agitated and the silt off the eggs. State hatchery personnel have recently begun using a machine which will do this better than the catfish, since male catfish have been known to shuck the whole thing and leave the eggs unattended.

Now, almost immediately after the eggs are laid and fertilized, the male is driven from the nest and the eggs are removed. They are then placed in baskets which are in turn placed in a long trough where water is agitated by fans driven by an electric motor.

Harmon Henderson, hatchery superintendent for the Department, says survival rate in the hatching trough has been tremendous.

The first hatch of eggs from a single channel catfish numbered approximately 36,000, all of them quite active. (Reprinted from 'News' of Texas Parks & Wildlife Dept., 6/2/69.)

* * *

RESTOCK OYSTERS IN SAN ANTONIO BAY

The Texas Parks and Wildlife Department has completed restocking oysters in most of San Antonio Bay and part of Espirito Bay. The flooding caused by Hurricane Beulah in Sept. 1967 had virtually eliminated oysters from these bays.

Terry Leary, marine fisheries coordinator, reported that the Department has been trying to restock the area using disaster aid money from BCF--but heavy rains and resulting low salinities in the past two years prevented it.

Leary says a natural seeding has occurred in the lower part of San Antonio Bay. The result has been a very hardy oyster that appears capable of surviving in almost fresh waters.

Fresh Water In Shell

"Ordinarily, when an oyster comes in contact with fresh water, it literally 'clams up,'" Leary noted. "But we have opened some of these oysters up and found fresh water on the inside of the shell."

The Department did not want to go outside the San Antonio-Espirito Bay system and possibly bring in new oyster diseases. So it contracted with local oyster fishermen to dredge up 500 barrels of these oysters at Panther Point and transplant them on reefs in other parts of the bay.

Leary says the work will be completed just in time for spawning season. Since each oyster may release up to a million spat, the reefs now devoid of oysters will be repopulated in a short time.

ARTICLES

RESEARCH ON A SYSTEM FOR BYPASSING JUVENILE SALMON & TROUT AROUND LOW-HEAD DAMS

Clifford W. Long and Richard F. Krcma

Young Pacific salmon (genus Oncorhynchus) and steelhead trout (Salmo gairdneri) from the upper Snake and Columbia Rivers must now pass through 6 to 9 low-head dams (such as Bonneville) on their journey to the sea. Although these dams are equipped with fish ladders to aid them when they return as adults, only recently have facilities for safe guarding them as juveniles begun to receive attention. Juvenile fish are subject to mortality from turbines and from predators immediately downstream from the dams.

BCF and the U.S. Army Corps of Engineers are now modifying existing facilities to protect juvenile fish. The method provides for diverting most of the fish that enter turbine intakes into a bypass. This report explains the nature of the modification, how it may protect fish, and the type of research needed to prove the adequacy of the system.

FISH-BYPASS SYSTEM AND ITS APPLICATIONS

Figure 1 is a cross section of the powerhouse at Ice Harbor Dam, cut through the center of a main turbine and intake. The proposed fish-bypass system would employ a self-cleaning traveling screen for intercepting fish in the intake and diverting them into a gatewell. Fish would pass from the gatewell, via a submerged port (fig. 2) to the ice sluice (fig. 3). The ice sluice, designed to carry ice and debris from the forebay around the dam, would also carry the fish safely to the tailrace. In more recently constructed dams, such as John Day, the ice sluice was not incorporated. Instead, the Corps of Engineers installed a special bypass to serve fish passage needs.

This fingerling-bypass system could be employed to protect young salmon and trout in one of two ways. The more costly application would be the use of traveling screens in every intake of every dam to guide fish around each dam. A less costly application would be to use the bypass system to capture all fish at the first (uppermost) dam reached by the fish and transport them by truck or barge around the rest of the dams. Under the latter plan, the fingerling-bypass system would incorporate a suitable trap in the ice sluice or fingerling bypass, which would collect the fish rather than let them pass into the tailrace.

Before the collection-and-transportation method can be adapted, we must demonstrate that fish transported around many miles of river can find their way back to their home streams. BCF has several transportation studies underway to provide an answer to this question.

Meanwhile, we can proceed with the development of the fingerling-bypass system with the understanding that, no matter which system is finally used, the basic fish-bypass system will apply.

RESEARCH REQUIRED

Verification of the adequacy of this fish-bypass system requires research on several aspects of its construction and use.

The traveling screen for guiding fish must be proved adequate, both biologically and mechanically. The device must be efficient

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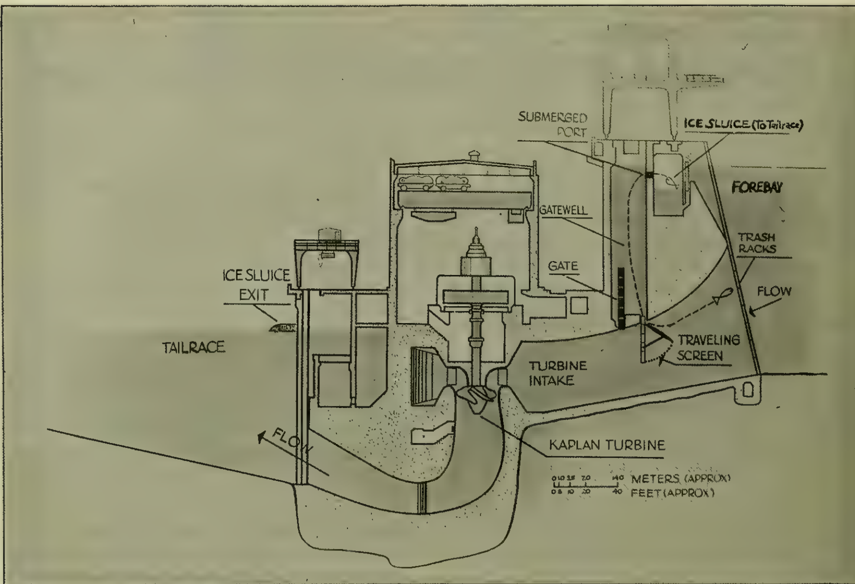

Fig. 1 - Proposed fish-bypass system for low-head dams would employ a traveling screen capable of diverting 70-80 percent of the young seagoing salmon and trout from intakes into gatewells. Fish would then pass through submerged ports to the ice sluice (or special bypass), where they could be collected for transport or allowed to pass on to the tailrace.

in diverting fish from intakes into gatewells. Small fish may impinge on the screen but will be carried by the screen up into the gatewell. Although present information suggests that brief periods of impingement will not harm the fish, additional work is required.

Laboratory studies will answer the question of impingement, but guiding efficiency can be determined only in turbine intakes. Hydraulic model studies, now being conducted for BCF by the Albrook Hydraulic Laboratory, Washington State University, can aid materially in describing the flows in the intake and gatewell created by the screen. From these studies, we can determine how to achieve hydraulic flow patterns that should produce maximum guiding efficiency and retention of guided fish in the gatewell.

Mechanically, we must demonstrate that the traveling screen: (1) is completely safe when placed immediately upstream from turbines (structural failure could cause damage to the turbine) and (2) can be operated for long periods without maintenance. Long-term tests in a large flume will be required.

Guided fish must pass readily through the submerged ports leading to the ice sluice. If the fish accumulate in the gatewell, alternative methods must be devised for more efficient passage. During tests on the latter half of the salmon run in 1968, research by BCF on 3 submerged ports (installed at McNary Dam by the Corps of Engineers) indicated that fish would pass through the ports with a minimum of delay. Further research will be carried out to measure rate of passage during the entire fish run--and to determine if the fish sustain injuries or mortality in passing through the ports.

Once fish are in the ice sluice, they must pass safely over a 36-ft. waterfall before they reach the tailrace downstream from the dam. Studies on survival in the ice sluice are required.

Finally, we must determine how bypassed fish should be released to minimize mortality from predation. Predators, such as northern squawfish (Ptychocheilus oregonensis) and seagulls, cause up to 33-percent loss of fish released in slack water below nonoverflow

Fig. 2 - Experimental submerged port (6-inch diameter) installed at McNary Dam by the U.S. Army Corps of Engineers. It passes fingerlings from one of the 44 intake gatewells into the ice sluice for transport around the turbines.

sections of the dam. Future research must determine where fish should be released in the tailrace to minimize predation, whether predation is reduced when fish are released only at night, and whether the spilling of water through a spillway gate near the release site reduces predation. From these and similar studies, BCF and the Corps can develop a system that will provide juvenile migrating fish with best possible protection at minimum cost.

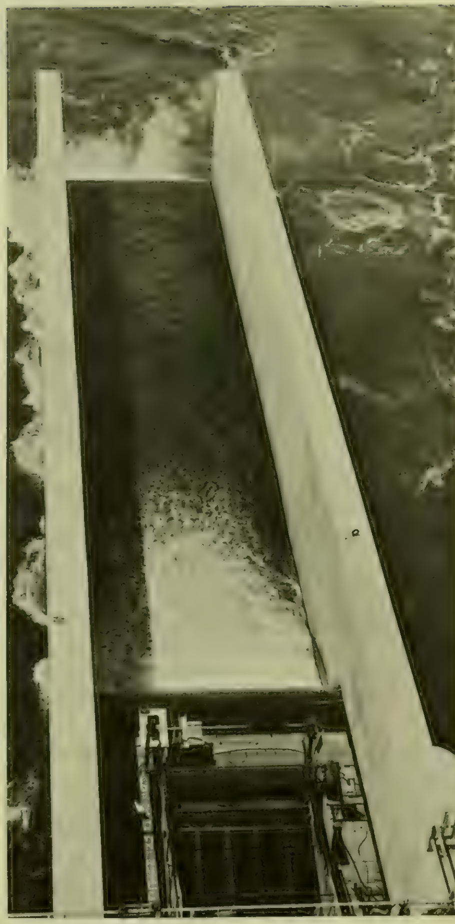

Fig. 3 - The ice sluice, used for transporting young fish around the turbines, discharges the fish in the tailrace about 120 feet downstream from McNary Dam.

The Corps of Engineers has provided BCF with funds to accelerate the development of this fish-bypass system. Moreover, the Corps already has equipped all 44 gatewells at McNary Dam with submerged ports. Research on these ports and on other aspects of bypassing fish are underway.

REVISIONS OF INTERNATIONAL AGREEMENTS AFFECTING ALASKAN FISHERIES

Ronald C. Naab

Recently the United States renegotiated several fishery agreements with Japan and the USSR that affect Alaska's fisheries. The principal changes in the agreements and the benefits to U.S. fishing interests are discussed in this article.

Alaska's commercial fisheries are: (1) dependent upon species that range the high seas far beyond waters of U.S. jurisdiction; (2) vulnerable to depletion by foreign fleets fishing on the high seas; and (3) receiving increasing protection through U.S. Government negotiation of international fisheries agreements. An earlier article[1/] traced the evolution of the safeguards afforded Alaskan fisheries as they were faced with increasing competition by the growing foreign fleets.

Constant changes in the Alaskan and foreign fisheries require frequent revisions of international fisheries agreements to ensure that maximum benefits are being obtained for U.S. fishery interests. In late 1968 and early 1969, U.S. negotiators and advisors met with their counterparts of Japan and the USSR to reexamine several fisheries agreements.

Japanese Agreements

Negotiations with Japan began in November 1968 and extended over 3 weeks. The discussions centered around 2 agreements and involved the questions of Japanese fishing for king and tanner crabs in the eastern Bering Sea, fishing for groundfish within the U.S. contiguous fishery zone off Alaska, and fishing for groundfish in high-seas waters off the coasts of Alaska, Washington, and Oregon. The new arrangements came into effect in late December 1968 and extended the agreements, as modified, until January 1971.

King Crab Catch Quota Halved

Provisions of the modified Japanese agreements are more favorable to U.S. fishing interests than the earlier ones. The Japanese king crab catch in the eastern Bering Sea in 1969 and 1970 will be only about one-half the 1967 and 1968 catches because their annual quota was reduced from 163,000 cases to 85,000 cases. Such a drastic reduction was needed to conserve the declining eastern Bering Sea king crab stocks while enabling U.S. fishermen to expand in the area and increase their share of the biologically allowable harvest. In addition, the modified king crab agreement further facilitated U.S. fisheries by providing for an enlarged crab pot sanctuary north of Unimak Island, within which no tangle net fishing for king crab will be allowed (figure 1). As in the earlier version, the agreement does not prohibit the Japanese from fishing in the sanctuary with other types of gear for other species. But the Japanese Government, as a domestic, is prohibiting trawling in an extensive area in the eastern Bering Sea, including the pot sanctuary.

Annual Tanner Crab Catches Limited

In recent years, the Japanese began fishing for tanner crab largely as an incidental catch by their king crab fleets. During 1968, however, the Japanese greatly increased their fishing for tanner crab to the point where the numbers of tanner crab taken far exceeded their king crab catch. Prompted, in part, by this increased Japanese fishery, the U.S. in November 1968 published a list of Continental Shelf fishery resources considered under its sole jurisdiction. Included were tanner and king crab. The recent negotiations, therefore, were expanded to include also tanner crab. The Japanese have agreed to take measures to ensure a prudent catch of tanner crabs in the eastern Bering Sea. It was feared that uncontrolled Japanese fishing for tanner crab could quickly deplete the resource--as it was becoming increasingly needed for Alaskan fisheries.

Mr. Naab is with the Enforcement and Surveillance staff, BCF, Juneau, Alaska.
This article was directed toward fishermen and processors.
1/CFR, October 1968, pp. 46-56. Also Sep. No. 825.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 841

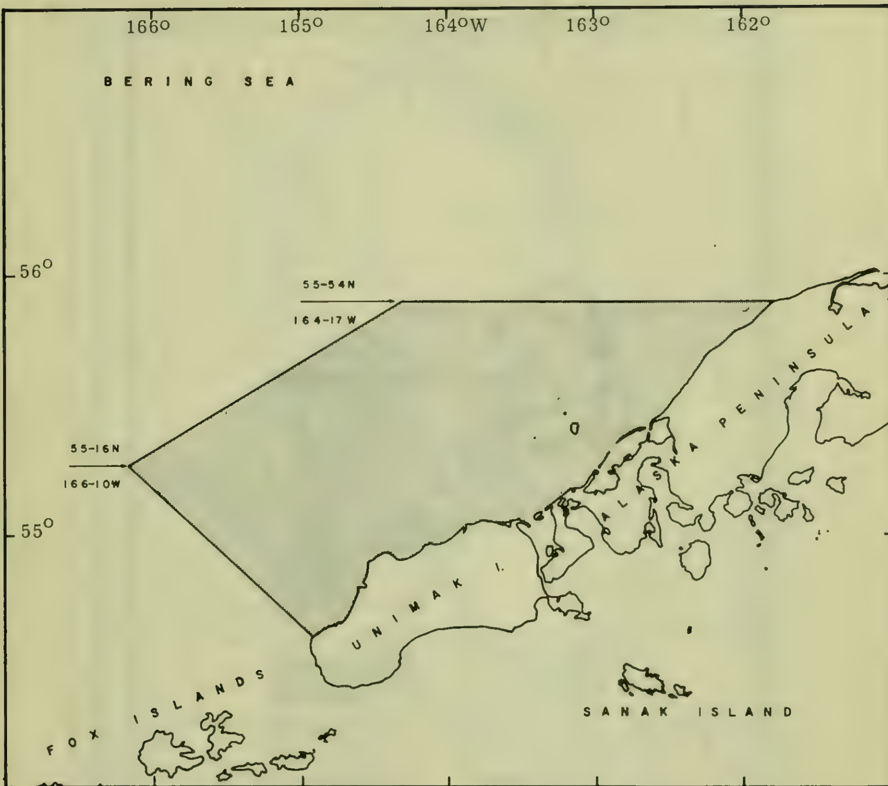

Fig. 1 - Eastern Bering Sea king crab pot sanctuary established by U.S.-Japan and U.S.-USSR Agreements.

Halibut Fishermen Further Protected

Gear interference and conflict between foreign fishing vessels and U.S. halibut vessels has been a problem. American halibut fishermen, for several years, have found it difficult to fish in areas of the Bering Sea because of the large numbers of foreign fishing vessels operating on the traditional halibut fishing grounds. The revised agreements provide for restrictions of Japanese fishing to avoid interfering with U.S. halibut fishing. These restrictions include a new commitment by the Japanese to refrain from trawling during darkness in an area of the eastern Bering Sea where U.S. fishermen are concentrated during the short period of the spring halibut season (figure 2). The extended agreements continued the provisions for the 2 zones in the Gulf of Alaska, where the Japanese will refrain from fishing during the first weeks of the halibut season.

New Loading Zones Designated

In return for Japanese concessions on the high seas, the U.S. agreed to new areas in which Japanese vessels could conduct loading operations within the 3- to 12-mile contiguous fishery zone. Two new loading zones were provided the Japanese in the Gulf of Alaska: one off Afognak Island north of Kodiak, another off Forrester Island near Dixon Entrance.

Other provisions of the 1967 agreements with the Japanese were continued in force.

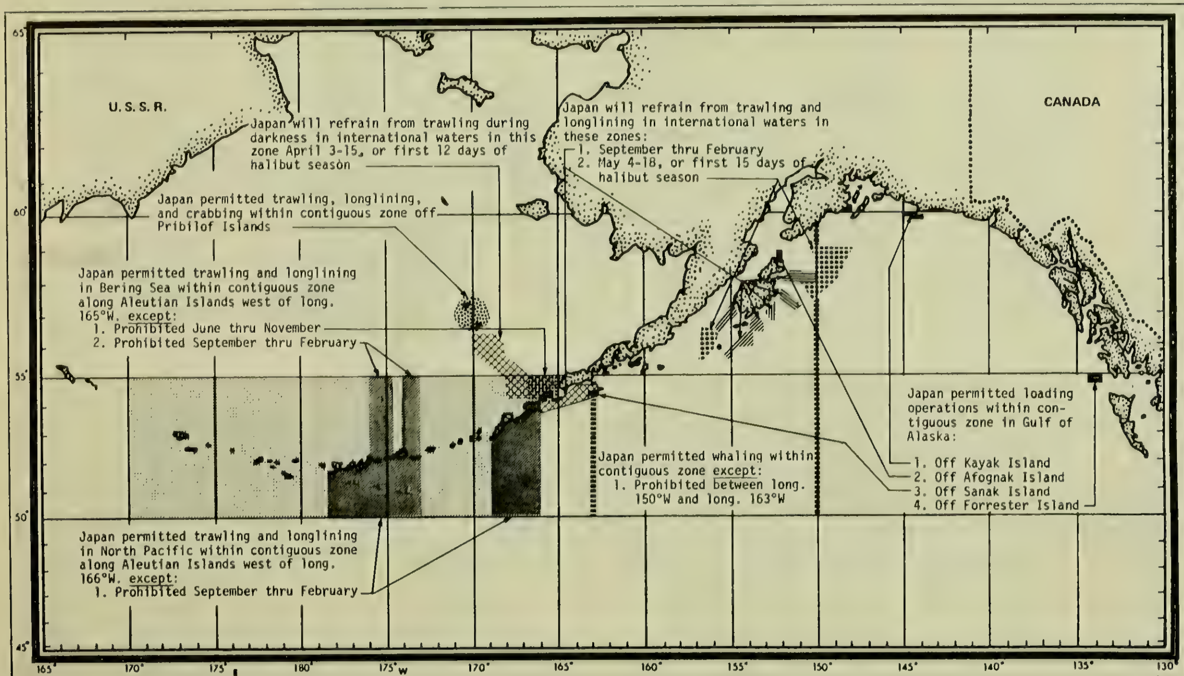

Fig. 2 - U.S.-Japan agreements implementing U.S. contiguous fishery zone May 1967, extended and modified December 1968.

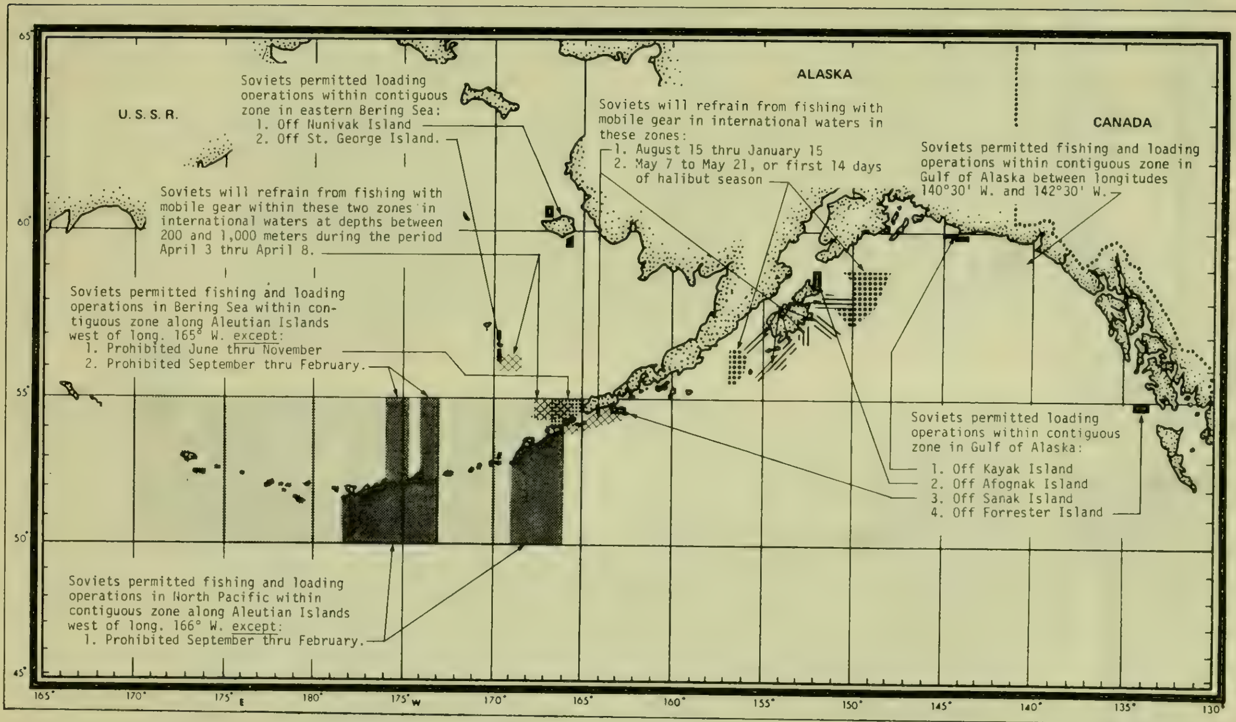

Fig. 3 - U.S.-USSR Fisheries Agreements of December 1964 and February 1967 as extended and modified January 1969.

Essentially, they afford protection to U.S. king crab fishermen on the high seas in 6 areas off Kodiak Island, and the Davidson Bank region south of Unimak Island; they permit the Japanese to fish within the contiguous fishery zone along the Aleutian Islands and off the Pribilof Islands.

Soviet Agreements

After nearly 4 weeks, negotiations with the Soviet Union ended in late January 1969 with the signing of modifications of 3 fishery agreements. The new arrangements are of 2-years' duration. They involve Soviet fishing for king and tanner crabs in the eastern Bering Sea; fishing within the contiguous fishery zone off the coasts of Alaska, Washington, Oregon, and California; and fishing in the vicinity of American crab pot and halibut longline concentrations on the high seas.

King Crab Catches Reduced

The new arrangements negotiated with the Soviets also were more advantageous to the U.S. than the earlier agreements. King crab fishing by the Soviets in the eastern Bering Sea was curtailed by reduction of their annual catch quota from 100,000 cases to 52,000 cases in 1969 and 1970. The Soviets also agreed to an expanded crab pot sanctuary; the boundaries are identical to those agreed to by the Japanese (figure 1). Provisions of the Soviet agreement not only prohibit fishing in the sanctuary with other than pot gear for king crab but also tanner crab. In addition, the Soviets agreed to refrain from trawling for other species within the sanctuary area. The latter provision should be beneficial to U.S. fishermen in the area faced with interference by the large Soviet winter flounder fishing expeditions north of the Alaska Peninsula.

Take of Tanner Crab Restricted

The Soviet catch of tanner crab from the U.S. Continental Shelf was also brought under control for the first time by the modified agreement. The Soviet take of tanner crab, unlike the Japanese, is primarily taken incidentally with king crab. It was limited to 40,000 cases (about 6 million crabs) annually in 1969 and 1970.

Halibut Grounds Closed to Trawlers

Soviet vessels operating near the traditional halibut fishing grounds in the eastern Bering Sea, like the Japanese, presented problems to American longline fishermen during the short spring halibut fishing season. The revised agreement calls for Soviet trawlers to refrain completely from fishing on 2 prime halibut fishing grounds during the first 6 days of the halibut season (figure 3). Protection of U.S. halibut fishermen from Soviet trawling in the 2 high-seas areas adjacent to Kodiak Island was continued in the new arrangements.

Crab Pot Areas Protected

U.S. king crab fishing on the high seas was also provided protection by the January agreements with the Soviets. The 6 high-seas areas of U.S. king crab pot concentrations off Kodiak Island remained closed to trawling during a period revised to coincide with present Alaskan crab fishing seasons. The Soviets also agreed to refrain from trawling during the king crab season in the same area on Davidson Bank as did the Japanese.

Additional Loading Zones Permitted

In view of the concessions on the high seas by the Soviet Union, the U.S. agreed to 3 new Soviet loading areas within the contiguous fishery zone: one in the Gulf of Alaska off Afognak Island, and 2 in the Bering Sea off St. George and off Nunivak Islands. In addition, the fishing areas allowed the Soviets within the contiguous fishery zone along the Aleutian Islands were altered. They now coincide with the fishing zones provided the Japanese. Other provisions of the 1967 agreement were continued without change.

ATLANTIC OCEAN FISHERY RESOURCES

"Report of the ACMRR/ICES Working Party of the Fishery Resources of the Eastern Central and Southeast Atlantic," FAO Fisheries Reports, No. 56, Supplement 1, Food and Agriculture Organization of the United Nations, Rome, 1968, 56 pp.

This is a summary of Working Party Studies of stocks in 3 regions--from Straits of Gibraltar to Cape Blanco; from Cape Blanco to mouth of Congo River; and from Congo southwards. It reports the present state of the stocks, fishing effort, proposals for improved reporting of fishery statistics, observations on problems of mesh regulation--and recommends areas of future research.

BRITISH ISLES

"British Freshwater Fishes--Factors Affecting Their Distribution," by Margaret E. Varley, Fishing News (Books) Ltd., London, 1967, 148 pp., illus.

Some British freshwater fishes have an economic value as food, notably salmon and trout and, to a lesser extent, eels. Their real value, however, is recreational--the provision of raw material for angling. Methods of fishing vary with the species, and anglers want to know what sort of fish to expect in a given location. Dr. Varley has answered their questions in this comprehensive treatment of the origins, environmental factors, distribution, feeding and commercial aspects of the freshwater fishes.

ESTIMATING ABUNDANCE

"The Abundance of Hake off South Africa," by D. H. Cushing, Fishery Investigations, Series II, Vol. XXV, No. 10, Ministry of Agriculture, Fisheries and Food, 1968, Her Majesty's Stationery Office, London, 20 pp., illus.

An echo sounder that resolves signals from fish into individual traces was used in a survey for hake within 4 fathoms of the bottom, between Cape Town and Walvis Bay in February 1966. With a statistical treatment of the results, it was possible to estimate the sizes of fish and density in numbers per cubic meter. The true power of this new technique may lie in the capacity to estimate absolute abundance acoustically.

In this paper, D.H. Cushing describes the method for estimating the absolute abundance of fish targets in size groups by acoustic methods. As the fish cannot be identified acoustically, he suggests that such surveys be supported by catches. In an exploited area, catches of the commercial fleet can be used for identification. In an unexploited area, the acoustic method endows the research vessel with the sampling power of a commercial fleet.

FRESHWATER RESEARCH

"Freshwater Fisheries Field Techniques--Tagging, Transportation, Mortality, and Drift Sampling," by C. J. Hardy, Fisheries Technical Report No. 27, New Zealand Marine Department, Wellington, 1968, 35 pp., illus.

This report describes a preformed wire loop for tagging trout; a thermally insulated lightweight livebox for holding and transporting trout; handling mortalities in trout sampling; and a simple lightweight drift sampler for streams. It also includes sections on electric fishing, anesthetics and sedation, fin clipping, and water temperature changes.

GEAR

"The Seine Net--Its Origin, Evolution and Use," by D. B. Thomson, Fishing News (Books) Ltd., London, 1969, 192 pp., illus.

In the past 50 years, commercial fishing has progressed from the state of a highly skilled but primitive art to a science. Documentation of fishing gear and methods is extremely important in a world of rapidly expanding technology. In the past, a fisherman

gathered his vast store of information from experience, observation, word of mouth, and ancient folklore. Today, a far greater and much faster dissemination of information is required. The fish-catching side has been the most poorly documented of all sections of the fishing industry.

D. B. Thomson, an expert mariner, fisherman, and teacher, provides a comprehensive and authoritative review of the seine net. He traces its history, evolution, and adaption to the needs of various fisheries and he provides an exhaustive record of its practical use in different parts of the world.

MEDICAL GUIDE

"Handy Medical Guide for Seafarers, Fishermen, Trawlermen, Yachtsmen," by R. W. Scott, Fishing News (Books) Ltd., London, 1969, 86 pp., illus.

This is a simple handbook suitable for ready reference in dealing with medical problems at sea. It is a practical aid designed primarily for conditions in distant-water trawlers. But it should be of value to other fishermen, seamen, yachtsmen, oil-rig crews, and to landsmen in isolated situations.

The following publications are available free from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209:

HATCHERY OPERATIONS

"Recent Advances in Artificial Culture of Salmon and Steelhead Trout of the Columbia River," by Fred Cleaver, Fishery Leaflet 623, Fish & Wildlife Service, Department of the Interior, 1969, 5 pp., illus.

Between 1948 and 1962, 21 hatcheries were constructed or remodeled on tributaries to the lower 180 miles of the Columbia River. By 1962, there was some doubt that the hatcheries contributed enough salmon and steelhead trout to justify their costs. Further construction was deferred until the value of hatchery production could be measured.

This is a report on the results and methods of a cost-benefit study. The catches from fish reared in the hatcheries were found to have increased rapidly, beginning in 1964. By 1967, the benefits from operation of the hatcheries appeared well in excess of their costs. The Oregon moist pellet diet seemed to be the greatest single factor in providing an economically favorable operation.

PESTICIDES

"Some Effects of DDT on the Ecology of Salmon Streams in Southeastern Alaska," by Roger J. Reed, SSR-Fisheries No. 542, Fish & Wildlife Service, Department of the Interior, 1966, 15 pp., illus.

Most watersheds in southeastern Alaska have valuable stands of Sitka spruce and western hemlock. Many of these watersheds contain streams with significant populations of trout and salmon. Concern about timber losses from infestations of black-headed budworm and hemlock sawfly caused U.S. Forest Service, in 1960, to propose a pilot study to evaluate effect on fish and wildlife of DDT in forested watersheds.

This paper describes a 4-year study of DDT's effects in 2 Alaska salmon streams. Direct harmful effects on fishes from DDT sprayed at a relatively low rate were not demonstrated, but the accompanying drastic reduction of aquatic insects may have reduced growth and survival of salmon and trout significantly.

LAKE MICHIGAN

"Bottom Trawl Explorations in Southern Lake Michigan, 1962-65," by Norman J. Reigle, Jr., Circular 301, Fish & Wildlife Service, Department of the Interior, 1969, 35 pp., illus.

The fish population of Lake Michigan has changed dramatically since the sea lamprey became plentiful--and the valuable food species subsequently declined. The recent explosive invasion by the alewife has had additional effects on the fauna. To survive, fishermen must now turn to the abundant low-value species, such as alewives and bloaters. In 1965, a limited trawl fishery landed over 12 million pounds of fish, primarily alewives and chubs.

This paper summarizes bottom trawl explorations from 1962 to 1965. Their purpose was to gather information on the seasonal depth and geographic distribution of abundant unutilized species in relation to their availability to a growing trawl fishery.

"Bottom Trawl Explorations in Green Bay of Lake Michigan, 1963-65," by Norman J.

Reigle, Jr., Circular 297, Fish & Wildlife Service, Department of the Interior, 14 pp., illus.

The commercial fishery in Green Bay was formerly a gill net and pound net fishery based primarily on common whitefish, lake herring, and yellow pike or walleye. If commercial fishing in Green Bay is to survive, fishermen will have to turn to the efficient harvesting of large volumes of low-priced industrial fish. Trawling is one way to accomplish this goal.

The aim of this study was to obtain the basic seasonal and bathymetric data needed to establish more effective and efficient methods of harvesting the existing fish resources. The paper reports the results of 179 exploratory drags, made during 11 cruises, to determine if bottom trawling in Green Bay is commercially feasible.

SHRIMP

"Length-Weight Relation and Conversion of 'Whole' and 'Headless' Weights of Royal-Red Shrimp, *Hymenopenaeus robustus* (Smith)," by Edward F. Klima, SSR-Fisheries No. 585, Fish & Wildlife Service, Department of the Interior, May 1969, 5 pp.

Over 70,000 pounds of headless (heads off) royal-red shrimp, worth more than $55,000, were landed during 1967. It has been estimated that the 3 commercial fishing areas off the southern U.S. could produce 1.6 million pounds of 20-count whole shrimp annually.

The development of a royal red shrimp fishery demands biological studies. Information on length-weight relation is required for studies of condition, growth, sexual maturity, and equilibrium yield in terms of weight. This paper gives the length-weight relation of royal-red shrimp for each of the 3 commercial fishing areas.

--Barbara Lundy

WHAT IS THE GREATEST DEPTH OF THE OCEAN AND WHERE IS IT?

According to the latest records, the greatest depth of 37,782 feet was observed in 1962 by the British survey ship COOK in the Mindanao Trench near the Philippines. This spot is now known as the Cook Deep. As long ago as 1927, depths in excess of 35,000 feet in the same area were reported by the German cruiser EMDEN.

In recent years, many other deeps have been measured by oceanographers. Some of those reported by British, Soviet, and U.S. ships follow:

In 1952, the British survey ship CHALLENGER located a depth of 35,640 feet in the Marianas Trench off Guam (the Challenger Deep). This depth was measured by an echo sounder; it took $7\frac{1}{4}$ seconds for the sound to reach the bottom. To confirm the sounding, a weighted cable was lowered to the bottom; this lowering required 90 minutes.

In 1959, the Soviet vessel VITYAZ reported a depth of 36,200 feet near the Challenger Deep. The Marianas Trench had been sounded in 1927 by the Japanese survey ship MANSHU, which recorded a depth of 32,190 feet.

On January 23, 1960, the bathyscape TRIESTE descended into the Marianas Trench to a depth of 35,800 feet.

Although most publicity has been given to the Marianas and Mindanao Trenches, very deep soundings have also been recorded in the Southern Hemisphere. In 1952, the U.S. research vessel HORIZON recorded a depth of 34,884 feet in the Tonga Trench, south of Samoa Islands. ("Questions About the Oceans," U.S. Naval Oceanographic Office.)

INTERNATIONAL

UN Calls for World Conference on Pollution

The United Nations has called for a world conference on pollution in 1972. The General Assembly has approved a resolution summoning a conference to promote international cooperation in "eliminating the impairment of human environment." The resolution was sponsored by 54 of the 124 member nations. It alerts all nations to the dangers resulting from man's ability to change and shape his environment. It emphasizes the "continuing and accelerating" pollution of water and air.

Sweden Is Prime Mover

Sweden is prime mover of the conference. She warns that the world soon may have "no escape" from the many forms of international pollution. Sweden outlawed the use of DDT in Apr. 1969.

Purposes of Conference

The Swedes see 2 principal reasons for the conference: (1) to exchange ideas on fighting local and regional pollution (including help for developing nations rushing into industrialization and urbanization). (2) To establish pollution-control standards and to determine who will pay costs of controlling pollution when it crosses national boundaries or threatens common environment. ('Resources,' Vol. 6, No. 1, 1969.)

World Program Launched to Conserve Sea Turtles

A campaign has been launched to save the world's sea turtles from extinction. Experts attended a 4-day conference in Switzerland to set plans. The conference was organized by the International Union for Conservation of Nature and Natural Resources and sponsored by the World Wildlife Fund.

Scientists and nature lovers are alarmed at the rate at which the 7 surviving species are being depleted. The turtles are being used for oil, calipee for soup, meat, eggs, leather, and shell.

The turtles are vulnerable from birth to death. The females often are killed when they come ashore to lay eggs; the eggs are taken by humans for food. Few baby turtles survive the long crawl from beach into sea; once in the sea, they face many enemies.

Conference's 7-Point Plan

The conference decided on a 7-point plan to "save this valuable marine resource from destruction":

(1) Action on breeding beaches to insure maximum incubating and hatching of turtle eggs.

(2) A survey and analysis of existing exploitation of marine turtles to provide basis for regulating size of commercial operations.

(3) A broad information program to educate public.

(4) Beach surveys to gather information for governments involved.

(5) Establishment of sanctuaries for turtles on islands in Atlantic, Pacific, and Indian Oceans.

(6) Appointment of scientist to coordinate conservation efforts.

(7) Periodic meetings of specialists to discuss conservation problems and progress. ('South African Digest,' May 9.)

U.S. & USSR Jointly Survey Ichthyoplankton on Georges Bank

R/V 'Prognoz' of the Soviet Atlantic Research Institute of Fisheries and Oceanography (ATLANTNIRO) and 'Albatross IV,' research vessel of BCF's Biological Laboratory at Woods Hole, Mass., have studied together

plankton samples and abundance of fish eggs and larvae on the southern and eastern parts of Georges Bank. The survey was part of the U.S.-USSR scientific exchange under the bilateral mid-Atlantic Fisheries Agreement.

Methods

The vessels operated simultaneously for 24 hours on 6 sampling strata. The survey's first phase ran from April 15 to 24; the second was scheduled for May 19 to 29. The vessels met off Martha's Vineyard to exchange personnel and equipment. During the first phase, a Soviet scientist boarded the Albatross IV and a U.S. biologist went aboard the Prognoz. Only about a third of the first phase had been completed when mechanical trouble forced Albatross IV into Boston for repairs. The second phase was expected to take place as scheduled.

Prognoz's Future Plans

The Prognoz will stay on Georges Bank until early August and explore electric light fishing for Atlantic saury. Other ATLANTNIRO research vessels are in the area longlining for swordfish.

U.S. and Argentina Conduct Oceanographic Project

For the third successive year, the U.S. and Argentina have collaborated in joint oceanographic studies off the South Atlantic coast.

The icebreaker USCG 'Glacier' has just completed the 1969 program in the Bay of San Mathias. Dr. Jack W. Pierce of the Smithsonian Institution and several Argentine scientists boarded her in Buenos Aires on April 9. Deep-coring operations, part of a continuing coastal sedimentation study, were finished on April 14. 'Glacier' had worked in the Wedell Sea from December 1968 to April 1969 with the Argentine icebreaker 'San Martin.'

Previous Studies

In December 1968, Dr. Frederic R. Siegel of George Washington University had worked in the project aboard 'Edisto'. Drs. Pierce and Siegel try to alternate in the research. They work aboard USCG icebreakers en route to and from the Antarctic. Their first voyage was aboard 'Oceanographer' in 1967.

Reports to Argentina

The U.S. scientists present regular progress reports to Argentine authorities on the results of this joint operation. The program is a fine example of cooperative bilateral scientific research. (U.S. Embassy, Buenos Aires, Apr. 23.)

Charges Up 10% for Chilean and Peruvian Fish Meal Shipped to U.S.

Charges for shipping fish meal from Peru and Chile to U.S. Gulf of Mexico and Atlantic ports increased 10% on March 10. The increase was due to a surcharge on all goods shipped. It was agreed to by the West Coast South American Northbound Conference, which is empowered to set rates for shipping to U.S. ports.

The surcharge is designed to restore to the shippers money lost during recent longshoremen's strike, and to gain funds to pay for the new contracts with longshoremen.

Rates in effect before the strike (sacked meal):

Less than 300 tons	$29.50 a metric ton
300-1,000 tons	$27.50 a metric ton
Over 1,000 tons	$24.50 a metric ton

The new rates simply add 10%. (Federal Maritime Commission.)

Japanese Survey Philippine Market for Canned Mackerel

The Japan External Trade Organization (JETRO), a government trade-promotion agency, recently published survey results of the canned mackerel, sardine, and saury market in the Philippines. The survey found good potential for increased canned mackerel exports.

There are only 2 fish canneries in the Philippines. One, the White Rose Packing Corp., with modern facilities, has a daily processing capacity of 120 tons. Due to lack of raw material, the plant has not been put into operation. The corporation has its own fishing boats but finds it more profitable to sell the catch fresh. Another problem is the high tariff on imports of tinplate (40% ad valorem) and tomato sauce (150% ad valorem). The canning industry has appealed for tariff cuts on those items, but the government has refused.

Other Canneries

The second cannery, Visayan Packing Corp., a wholly Philippine-owned firm established in 1955, is the only fish cannery in operation. It packs tuna, mackerel, sardines, and tangerines, and exports frozen tuna to the U.S. A third tuna and mackerel cannery is scheduled for construction by the end of 1969.

Canned Sardine Imports Banned

The Philippine Government, in 1963 and again in 1967, banned canned sardine imports from the Union of South Africa because of her apartheid policy. In 1967, the Cebu United Enterprises had requested the Government to allow imports from South Africa, claiming South African product cost less than Japanese imports. Cebu also claimed that Japanese and U.S. canned sardines were actually South African sardines packed under different labels.

Japan Major Canned Mackerel Supplier

The Philippine population and the demand for protein continue to grow. These cannot be adequately supplied domestically, so Japan probably will continue to be a major supplier of canned mackerel. Since the Japanese product does not compete with Philippine domestic brands, imports from Japan are likely to increase. To expand the canned mackerel and saury market in the Philippines, efforts must be made to promote greater consumer interest and acceptance. ('Nihon Suisan Shimbun,' Apr. 4.)

Japanese-Australian Shrimp Venture Makes Good Hauls

A Nihon Suisan-owned fleet--6 shrimp trawlers (100 gross tons) and one 386-ton processing vessel--operating in Gulf of Carpentaria, northern Australia, made good hauls of shrimp (mostly banana) in mid-April. Catch per vessel per day was around 660 pounds; about 570 pounds is considered the break-even point for 100-ton-class shrimp vessels.

Other Joint Ventures

Nihon Suisan began shrimp fishing in Gulf of Carpentaria in Oct. 1968 jointly with Australian Hickman Company. They established the Northern Research Pty. Ltd. at Darwin. Two other Japanese-Australian shrimp ventures also are based at Darwin. ('Minato Shimbun,' Apr. 17.)

S. Korean Team Recommends Tuna Fleet & Freezer Plant for El Salvador

A S. Korean team studied El Salvador's fisheries for 3 weeks in late Jan.-early Feb. 1969. It has recommended that El Salvador obtain 10 longliners, build a freezer plant, and enter the eastern tropical Pacific tuna fishery.

The team's 114-page report recommends: (1) purchase of ten 200-300-gross-ton longliners, (2) build a 1,000-ton-capacity (20 tons per day) shore freezer plant at Acajutla, and (3) develop the technical skill to use those facilities.

S. Korea would provide technical experts to train fishermen and get Salvadoreans started; she could build the vessels in her own boatyards.

Study Team's Thinking

The project could survive on an annual catch of 6,000 metric tons of assorted tunas; about 27% (yellowfin, skipjack, bluefin, albacore) could be marketed in the U.S. The rest could be sold to Japan. All tunas would be

sold frozen. El Salvador could encourage landings by foreign vessels to utilize plant's excess capacity and allow its operation when domestic vessels were unable to fulfill quotas.

Relations With IATTC

The yellowfin catch--1,080 tons, about 18% of 6,000-ton-projected tuna total--would not involve difficulties with the U.S. over the IATTC. This is because the yellowfin catch would be less than the 4,000-ton threshold limit agreed to by IATTC in March. For 1969, after closure, vessels under 300 tons will be permitted unrestricted fishing until aggregate yellowfin catch for a country reaches 4,000 short tons. After that, all vessels would be subject to 15% limitation on yellowfin. El Salvador is not an IATTC member.

A Trip's Expenses

These are some projected total expenses for a 5-month fishing voyage for a vessel with 24-27 men: crew salary, $6,600 (less than $60 per man per month); food $600; bait $7,800.

The S. Koreans have about 40 idle longliners they are recommending to El Salvador.

IAFMM Meetings Scheduled

The Executive Council of the International Association of Fish Meal Manufacturers (IAFMM) met in Madrid, Spain, Apr. 15-16. Representatives of fish meal producers from 12 countries attended.

The Association's Director reviewed the latest information on current and potential production, consumption trends, and market prospects.

Meetings Slated

The Ninth Annual Conference is scheduled for Cannes, France, Oct. 6-10, 1969. Executive Council and Scientific Committee meetings have been scheduled for April 1970 in the United States (possibly at College Park, Md.). (U.S. Embassy, Copenhagen, Apr. 29.)

NEW DOCUMENTARY SERVICES
(Provided by the Food and Agriculture Organization of the United Nations, Rome, Italy)

The wealth of technical, economic and social information, contained in some 25,000 publications and documents produced by FAO since its creation in 1945, is now readily available through the services provided by the FAO Documentation Centre.

- Published indexes (Monthly "Current Index" - since January 1967 - and retrospective "Special Indexes" - for the period 1945-1966) permit the selection of documents of interest in the fields of agriculture, fisheries, forestry, nutrition, rural economy, etc., through thousands of subject matter, author and title references in each field.

- A "Question and Answer" service provides, on request, ad hoc bibliographies on specific subjects.

- Documents of interest can be obtained in original form (printed or mimeographed) or, if out of stock, in the form of photocopies or microfiches.

- The "Current Index" is sent, free of charge, on request. Details on other services (Retrospective Indexes, "Question and Answer" service, Reproduction Services) will be obtained by writing to the: FAO Documentation Centre (Ref.P.69), FAO Headquarters, Via Terme di Caracalla, 00100, Rome, Italy.

FOREIGN

CANADA

PLANS EXCLUSIVE FISHING ZONES

Canada will establish exclusive fishing zones on her east and west coasts, Minister of Fisheries and Forestry Jack Davis announced April 5. Lines will be drawn from headland to headland on both coasts. The lines will cover immediately all sections where Canada's territorial waters and fishing zones can be measured from the same baseline.

There are a few important exceptions, Davis noted. "I am thinking particularly of the Gulf of St. Lawrence. In this case, where it may not be desirable to close off all of the Gulf as internal waters, we can still make it an exclusive Canadian fishing zone. However, we will first have to change the law. This we intend to do in the next session of Parliament."

The Minister indicated that baselines will be drawn from headland to headland down the east coast of Nova Scotia. "This we can do right away," he said, "because there is no conflict between inland waters (i.e., navigation, etc.) and fishing zones along this section of our coast."

Statement of Intentions

The formal statement of the Canadian Government's intentions was outlined as follows:

The Canadian Government will shortly issue a list of geographical coordinates for the establishment of straight baselines, further defining Canada's territorial sea and exclusive fishing zones on both our east and west coasts.

Additional Baselines

Maps published in 1967 already show straight baselines down the coast of Labrador, and around the east and south coasts of Newfoundland. Further baselines will now be drawn from headland to headland down the east coast of Nova Scotia, and up along the west coasts of Vancouver Island and the Queen Charlotte Islands. These additional lines will also enclose as internal waters of Canada numerous bays and inlets. These will in their entirety become Canada's fisheries waters.

New Maps

Maps will be published illustrating this further demarcation of Canada's internal waters, territorial sea, and exclusive fishing zones. These maps will show several important gaps remaining along east and west coasts after issuance of the coordinates. The Government will deal with these gaps after amending the Territorial Sea and Fishing Zones Act. This is scheduled for Parliament's next session.

To Amend Present Act

At present, the Territorial Sea and Fishing Zones Act provides only for drawing straight baselines. These define Canada's internal waters, on the landward side of the baselines, and her territorial sea and fishing zones, which extend a total of 12 miles seaward of the baselines. To provide added flexibility for dealing with certain coastal areas, the Act will be amended to permit the Governor-in-Council to draw "fisheries closing lines." The lines will enclose these areas as exclusive fishing zones, without affecting the limits of Canada's internal waters or territorial sea.

Traditional Fisheries & Treaties

Traditional fishing practices of other countries will be considered. However, establishment of baselines, and fisheries closing lines along remaining sections of coastline, will make it possible to conclude negotiations for phasing out these traditional fishing practices. Existing treaty rights will be respected. Also, it is proposed to maintain the present reciprocal fishing arrangements with the U.S.

Minister Davis concluded that this statement involving changes to Canada's Territorial Sea and Fishing Zones Act was being made now to advise other countries of Canada's intention to complete a national system of exclusive fishing zones. (Canadian Dept. of Fisheries and Forestry, Apr. 5.)

* * *

Canada (Contd.):

MARITIME LANDINGS IMPROVE

The fishery catch in Canada's maritime provinces--Nova Scotia, New Brunswick, and Prince Edward Island--for the first two months of 1969 was substantially higher than in 1968 and 1967. It also improved in total value, although prices per pound were lower than in 1968 and 1967. The lower unit value in 1969, compared with first 2 months of 1968, appeared related to much heavier herring landings, which command lower prices. During Feb. 1969, only haddock, halibut, pollock, and scallop landings were below the 3-year average in quantity. (U.S. Consulate, Halifax, Mar. 21; Dept. of Fisheries of Canada, Mar. 18.)

Maritime Fish Landings

	Jan.-Feb.		
	1969	1968	1967
Landings (million lbs.). . . .	98.6	68.3	63.0
Total value (million C$). . .	4.9	3.6	3.8
Price per pound (C$)1/. . . .	0.0497	0.0527	0.0603

1/Paid vessel by first buyer.

* * *

NEWFOUNDLAND LANDINGS INCREASE

Newfoundland landings in first-quarter 1969 were considerably higher than in same period of 1968. Landings totaled 281 million pounds through March, compared to 224 million in 1968. Ex-vessel value was up from C$4 million in 1968 to $4.3 million in 1969.

Species Landed

Landings of the more expensive varieties--cod, haddock, halibut, flounder, sole, turbot, and pollock--were generally down for all months. Only haddock had increased by the end of March; cod had an initial upturn in January, but was down nearly 6 million pounds by end of quarter.

Landings of less expensive varieties--ocean perch, hake, catfish, herring--gained steadily. Herring particularly showed a phenomenal gain; it increased over 50 million pounds for first 3 months. This is especially noteworthy in view of the 'dead, red herring' scare plaguing fishermen in Placentia Bay and in St. Mary's Bay. Scallops also showed a sharp upturn due to greater demand and more refined processing. (U.S. Consul, St. John's, Apr. 25.)

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PRICE OF L. ERIE YELLOW PERCH TO BE STABILIZED

The Canadian Fisheries Prices Support Board (FPSB) has one million Canadian dollars available to stabilize the price paid fishermen for yellow perch from Lake Erie. This program is intended to firm up prices paid fishermen by both the processing industry and the trade. FPSB will buy frozen perch fillets from processors on condition that fishermen are paid a boat price of 8¢ a pound for spring-caught perch (Apr. 1 to May 31, 1969) and 10¢ a pound during rest of the year (June 1, 1969, to Mar. 31, 1970).

1968 Prices

The Board also bought large quantities of Lake Erie perch in 1968. Those purchases were conditional on fishermen being paid 7¢ in the spring and 10¢ in the fall. The main difference in 1969 is that the Board will not purchase spring perch "in the round."

Not A Subsidy

All of the Board's costs should be recovered by resale of the fish before Mar. 31, 1970, eliminating any element of subsidy in this year's program. (Canadian Dept. of Fisheries and Forestry, Apr. 3.)

* * *

CALLS FOR TENDERS ON FROZEN GROUNDFISH SUPPLIES

Fisheries and Forestry Minister Jack Davis announced April 24 that the Fisheries Prices Support Board was calling for tenders on the supply of Canadian frozen groundfish products. This followed his earlier announcement of a government purchasing program to strengthen and stabilize market prices for frozen groundfish products.

The program is one in a series designed to assist groundfish industry recovery from the severe market declines that began in 1967. Their object is to forestall further distress selling--and so raise market price to the point where it will cover the efficient producers' basic costs.

Canada (Contd.):

80 Processors Invited

The Fisheries Prices Support Board was to invite tenders from about 80 frozen cod and ocean perch processors on the Atlantic Coast. Initial contracts were to be awarded early in May.

Davis said this and other programs, including a working capital loans program already in operation, will have a salutary effect on the market. He added that the outlook for the 1969 season is good. (Canadian Dept. of Fisheries, Apr. 24.)

* * *

RECORD HARVEST IN 1968

Canada's harvest of fish and shellfish set another record in 1968. Estimated fresh- and salt-water landings were nearly 2.8 billion pounds; landed value was C$185.1 million.

The yield from sea fisheries on both coasts was more than 2.6 billion pounds; landed value, $169.1 million. The fresh-water fish harvest was 120,000,000 pounds worth $16 million exvessel. Landings by Atlantic coast fishermen were just under 2.4 billion pounds; landed value was $113.8 million. Pacific coast fishermen landed 255.8 million pounds worth over $55.3 million.

Lobsters & Salmon Led

Again, lobsters were the most valuable east coast species--over 37 million pounds with landed value of $25.1 million.

Salmon took the lead for British Columbia fishermen: nearly 180 million pounds with landed value of $44.5 million.

Pacific salmon fishermen enjoyed good catches, but returns to the gill-net fleet were particularly high. Landings by salmon gillnetters were worth $20 million, nearly 40% above the 1958 record. The value of catch by salmon seiners, nearly $13 million, was $3.5 million above 1967.

B.C. Halibut

Halibut landings by British Columbia fishermen were 28 million pounds; landed value, 7.1 million dollars, up about 10% from 1967. Prices to fishermen averaged around 25 cents a pound, unchanged from 1967.

Herring Down

The herring reduction fishery was closed in 1968 due to low stock level. Production was limited to bait and experimental fishing. Value of landings was only $160,000.

Groundfish & Shellfish

Landings of grey and ling cod and sole, and other groundfish, rose about 10% over 1967. Landings were worth 1.8 million dollars to fishermen. Landings of most shellfish were down from 1967, although shrimp producers recorded a slight increase.

Phenomenal Queen Crab Fishery

A highlight of the Atlantic coast fishery was the almost phenomenal growth of the queen crab fishery. It paralleled spectacular increases in herring catches. Until 3 years ago, the queen crab was regarded as a nuisance. Then it became a money-maker for fishermen and a table delight for gourmets. This resulted from efforts of federal-provincial agencies and the fishing industry.

From zero in 1965, landings reached 600,000 pounds in 1966. In 1967, the catch jumped to 2,000,000 pounds. The 1968 catch exceeded 9.3 million pounds worth over $886,000. This hardy, 8-legged crustacean is providing new income for more fishermen.

Atlantic Herring Boom

The growth of the Atlantic herring fishery has been spectacular. It began when large purse seiners began to make heavy catches. This was followed closely by the introduction of midwater trawl fishing sponsored by federal and provincial departments. The gear has special advantage of being able to catch herring in daylight. During that period, they are largely dispersed and are found usually at greater depths than during darkness. In darkness, the purse seine is still the most effective fishing tool.

The effectiveness of the midwater trawl for herring was demonstrated effectively by a 156-foot stern ramp trawler out of Riverport, N.S. In one week's fishing, she landed 1,200 tons; the heaviest single catch was 427 tons.

Canada (Contd.):

Seaweed Industry

The seaweed industry, too, is showing rapid growth on the Atlantic coast. One seaweed, Irish moss, has become very important economically to some fishing communities. In the past 25 years, the Irish moss harvest in the Maritime Provinces (N.S., N.B., P.E.I.) has grown from 1.5 million pounds, worth \$30,000 exvessel, to over 79 million pounds worth nearly \$2.5 million.

To promote this industry's growth, a Marine Plants Experimental Station was built by Canada's Department of Fisheries at Miminegash, P.E.I. in 1966. This plant provides mechanical drying facilities for Irish moss. Within 2 years, 2 commercial plants were established nearby. Now the Station focuses on general development of Canada's marine-plants industry where there is a seaweed potential.

Besides Irish moss, other seaweeds in the Atlantic Provinces are utilized.

Upward Trend

The 1968 story of increased production is in line with the general trend of past 15 years. In the decade ending in 1966, Canada's fish production gained 18%; returns to fishermen in dollars rose 67%. Better fishing techniques and more efficient vessels and gear are credited. ('Fisheries of Canada,' Apr.)

* * *

BEGINS PRICE DEFICIENCY PAYMENTS FOR SALTED COD

Canada's Fisheries Prices Support Board is being asked to support the price paid to Atlantic coast inshore fishermen for 1969 salted cod production. This deficiency payment program is designed to assist fishermen who suffered severe price declines as a result of devaluation and oversupply in foreign markets in 1968. These fishermen would encounter similar conditions in 1969.

The Payment

The Board will pay fishermen an amount to bring total price they receive for 1969 catch up to 1966-67 level. This supplementary payment will be made on certain grades of fish only. It will be made directly to the fishermen after the season is over and after the salted cod has been sold to exporters. Payment is being limited to certain grades to encourage production of better-quality fish.

Each fisherman would receive half the difference between price obtained for each specified grade of salted cod and "target" price for same grade. This "target" price is the one fishermen may receive from the private fish trade as market conditions improve.

Exact Payments Not Yet Fixed

At present, the market returns for 1969 cannot be forecast. So final payments to fishermen and support levels cannot be worked out precisely. Had the new scheme been in effect in 1968, the final price received by each fisherman would have been raised by 50% of difference between 1968 price and government's new "target" price.

The program is an interim measure. Other steps will be outlined to reorganize salted cod industry in 1970 and thereafter.

An advisory committee of fishermen and salted cod fish trade is being appointed to advise the Minister on administration of this new program and its impact on the incomes of fishermen in Newfoundland, Quebec, and Maritime Provinces. (Canada's Dept. of Fisheries and Forestry, Apr. 25.)

* * *

OUTLOOK FOR EAST COAST FISHERIES IS OPTIMISTIC

A generally optimistic future for Canada's East Coast fishing industry was forecast in mid-March by the Atlantic Development Board (ADB), but employment prospects are expected to drop sharply.

The forecasts are contained in a review of the industry by ADB staff and fishery experts in 3 provinces. The industry is expected to increase its groundfish markets by 50% in 1967-1975.

Two-thirds of output now goes to the U.S.; Canada is expected to retain its share of total U.S. consumption, which is forecast to rise. Canadian demand will increase 20% to 130 million pounds.

Canada (Contd.):

Prospects are good for production of fish meal and oil from herring reduction. Large new fish plants are indicated in the Fundy region, Western Nova Scotia, and Eastern Newfoundland.

1970 Demand May Equal 1966's

The study says it will be 1970 before demand reaches the 1966 level. That preceded a decree by the Roman Catholic Church in the U.S. permitting the eating of meat on Friday.

Prices also were depressed by overrapid industry expansion. They have begun to improve.

Industry Needs Major Changes

While near- and longer-term outlook appears good, overall improvements will not be made without major industry changes. In 1965, the primary fishery employed about 45,000 persons, 8% of labor force in Atlantic Provinces. Of these, only 6,000 worked more than 10 months of year, 27,000 worked 5 to 10 months, and remainder less than 5 months. The industry contributes about 6% to net commodity production in the region: from 2.2% in New Brunswick to 10.5% in Prince Edward Island. It contributes about C$53 million to the region's total manufacturing output of $514 million. It employs 10,700 people in 520 fish-processing plants.

Deep-Water Fishing Trend

The major change predicted by the report is a quickened trend from inshore to deep-water fishing. This will lead to a substantial reduction in job opportunities in inshore fishery; increased manpower needs offshore will be only partial compensation.

Compared to inshore fishery, landed values per fisherman in Atlantic offshore fishery are high; these averaged $7,300 in 1964. The report sees growth potential here for East Coast fishery.

An expanded trawler fleet will draw on manpower reserves in inshore fishery. But a fleet increase of 3 or 4 times would provide jobs for relatively few fishermen.

Sufficient Resources

Contrary to common fears of depleting North Atlantic fisheries, the report says there is no doubt that sufficient resources exist to permit expansion of Canada's catch.

Landings and processing have tended to be concentrated in fewer ports--but not necessarily where greatest economic benefit might have resulted. A clear advantage has developed from larger-scale operations. The report states: "It is the larger firms which create the greater value added per man-hour on per dollar of wages. The conclusion is inescapable that the benefits to the region will be greater if future increases in production take place in a relatively small number of large processing plants."

Where Expansion Is Desirable

No expansion of groundfish capacity is desirable in the Gulf of St. Lawrence. Additions to processing should not be encouraged in Eastern Nova Scotia and Southern Newfoundland--but encouraged in Fundy area, Western Nova Scotia, and Eastern Newfoundland.

The study suggests Shelburne as the growth port in Western Nova Scotia. One major port in Charlotte County, N.B., should be selected as development point on Fundy shore. Harbour Grace is best suited for development as trawler harbor in Eastern Newfoundland. ('The Globe and Mail,' Mar. 21.)

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DAVIS ASKS END OF CANADA-U.S. FISHERY TARIFFS

On May 6, Canadian Fisheries Minister Jack Davis called for abolition of tariffs on fish products between Canada and the U.S. He spoke at annual meeting of Fisheries Council of Canada.

Mr. Davis said: "We must obtain reciprocity with the U.S. not only in fishing in each other's waters, but also on the trade front as well. We must be able to buy our supplies and equipment at the lowest possible price and we must be able to sell our products with a minimum of red tape.

"Essentially we must wipe out the tariff barriers between us. We must do away with quotas. And we must make sure, with the

Canada (Contd.):

aid of a superior Canadian Inspection Service, that there is never any question about the quality of Canadian fish."

Exporting Nation

Davis said Canada will always be an exporting nation. "We have a larger source relative to our population. We are also out-fishing our American brethren east and west, north and south. We are out-fishing the Russians and Japanese as well. We are catching more fish per fishermen, per boat and per day at sea."

Price the Problem

The most difficult area in industry was price, he said. "Most prices, and certainly most costs, have been going up. But the export price for some of our principal products has tended to go down. As a result we are being caught, increasingly, in a cost-price squeeze. We are being hurt even when the retail price for our fish in other countries is going up."

He noted that the groundfish industry is being squeezed hard. Plants had closed and new facilities were standing idle. "This doesn't make much sense in the context of rising consumption and a stable price at the retail level in the United States." Many reasons had been given for the setbacks, but he blamed the industry's financial weakness. Some groundfish exporters were so badly off that they had to convert fish into cash immediately.

Price Support

Davis revealed: "In order to correct the situation the Canadian government has moved in. We have asked our fisheries prices support board to help stabilize the market.... This is not a subsidy operation. We do not intend to lose money." The board will buy fish at market prices, hold it until prices improve, and recover costs in market place.

Limiting Licenses

He said some things will have to be done in interests of conservation and good management. "One of these things is license limitation. We will have to limit the entry of new boats into some of our fisheries. Our lobster fishery on the East Coast is a case in point. Our salmon fishery on the West Coast is another. In both of these instances we are overequipped. We are overequipped by a factor of 2 to 1. So a gradual reduction on boats and gear is imperative.

"It is imperative if our fishermen are to earn a decent living and it is imperative if we are to cut down on the social assistance which is being paid to part-time fishermen on both coasts."

Predicts Fewer Firms

The Canadian Fisheries Minister predicted fewer firms and fewer fishermen in the industry. But the overall outlook was promising. Prices were rising and costs levelling off. "The cost-price squeeze will subside and life will be a little easier all round," he concluded.

EUROPE

USSR

SONAR STUDIES PACIFIC SALMON MIGRATIONS

Scientists from the Kamchatka Branch of the Soviet Pacific Research Institute for Fisheries and Oceanography (TINRO) are using sonar to track the migration routes of salmon in the Pacific and the Sea of Okhotsk. Sonar also will be used to determine the number of salmon. The scientists say this method enables accurate assessment of the status of the salmon resource, and allows scientific predictions of future catches.

Natural Salmon Reproduction

Kamchatka is first in natural salmon reproduction in the Soviet Far East. The sparsely populated area's many large and small rivers offer ideal conditions for salmon propagation. (TASS, Mar. 25.)

* * *

IMPROVE CULTURE OF FRESHWATER CRUSTACEANS & FISHES

Biologists have developed a method of breeding that has saved crayfish ('Astacus') from extinction in Lithuania. Up to 90 young have been hatched from each female stripped of fertilized eggs. Hatchings 6 to 10 days old are released into ponds in the spring when water temperatures range between 10° and 15° C. (50°-59° F.). This year, hatcheries in east Lithuania will release about half a million into rivers and lakes.

Carp

Acclimatization of silver carp and bighead has progressed well in the Azov-Kuban region. Rice field culture of these species has increased steadily in recent years. ('FAO Fish Culture Bulletin,' vol. 1 (2) Jan. 1969.)

* * *

BUILDS NEW STERN FACTORY TRAWLERS

Baltiia shipyards at Klajpeda is building a modified class of stern factory trawlers (BMRT). The first, 'Luchegorsk,' was launched in early January 1969. She displaces 4,000 tons and can produce 70 metric tons of fish meal and 30 tons of frozen fish a day. Equipped with automatic lines for fish-meal production, her production capacity is triple the regular BMRT's.

Probably Fish Pollock

Luchegorsk was assigned to the Far Eastern Fisheries Administration's Kamchatka fleet. On her way to the Pacific in March, she successfully tested her equipment off Spanish Sahara and the Canary Islands.

The new BMRT probably will be deployed in Soviet Alaska pollock fishery. Alaska pollock is used almost entirely for fish meal.

* * *

NEW UNDERWATER RESEARCH VESSEL TESTED

'Sever-2,' a new Soviet underwater research craft, passed her first (unmanned) test successfully. She was lowered to 2,185 meters (1,000 fathoms) in the Black Sea, off Sevastopol, in Mar. 1969.

The 20-metric-ton craft is equipped with a movable mechanical "hand" modeled after the human hand, several searchlights, and a light outside the hull supported by a special arm. She also carries supersensitive sound recorders, underwater cameras, and instruments to measure chemical composition and physical properties of water.

Physical Characteristics

Not a hydrostat, like 'Sever-1,' she can move at "speed of a running man" (about 5 miles an hour) at depths of 1,000 fathoms. She also can spin around her axis on one spot. The hull is encased in streamlined plexiglass "casing." The searchlights, mechanical "hand," and light protrude outside casing. Living quarters for a 3-man crew are equipped with air-regeneration units, fresh water, thermos containers for hot food, and battery power for underwater stays up to 3 days.

For Research

The craft is expected to be operational by the end of the year. She then will be turned over to Fisheries Ministry for research in North Atlantic and Arctic.

USSR (Contd.):

A specially designed mothership will carry Sever-2 in a hangar alongside, where temperature and moisture will be kept constant. The craft will be used to develop a technique for artificial fish schooling, and to study the reactions of fish to light and sound. ('Pravda,' Mar. 22.)

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COMPUTERIZED MODEL OF WORLD OCEANS PLANNED

Scientists in Leningrad have begun to build a mathematical model of the world oceans. They are using a system of equations that describes the oceans' basic characteristics--horizontal and vertical currents, temperature, and salinity.

In a successful trial, the computer calculated correctly changes in currents off the western shores of the Atlantic and the Pacific. The calculations were confirmed by independent oceanographic observations. It also computed accurately the time needed for currents to develop in relation to wind force and direction.

Being Built at Leningrad

The model is being built by the Leningrad Branch of the Central Institute for Mathematical Economics and the Leningrad Laboratory of the Institute of Oceanology. If successful, it will provide a true "portrait" of the ocean. The scientists believe the model will allow them to determine changes in the velocity of currents without sending out research vessels. (TASS, Mar. 25.)

Note: Soviet research is interesting and exciting. The model's validity will be demonstrated only after years of practical testing. Soviet oceanographers probably have covered more of world oceans than other oceanographers because of large oceanographic research vessels they have received from Poland and East Germany and their own wide-ranging research vessels. A successful model could affect world fisheries and shipping.

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NEW DEVICE DETERMINES SALINITY

Soviet oceanographers used to determine sea-water salinity by taking a sample every 5 to 10 kilometers and determining the most important factors by chemical analysis. They often complained about the lapses in information between time of sampling and when they obtained the results of measurements.

Now the Far Eastern Scientific Research Institute for Geology's Geophysical Laboratory has designed a new device for continuous measurement of water salinity. The device will be tested by vessels from the Institute of Oceanology's Leningrad branch.

Note: U.S. oceanographers have used U.S.-manufactured continuous salinity-measuring devices for several years.

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'VITIAZ' ENDS CRUISE IN EQUATORIAL PACIFIC

The Soviet research vessel 'Vitiaz' has completed her 44th cruise in the equatorial Pacific. Expedition chief M. E. Vinogradov reports the collection of unique quantitative data on biological productivity. For the first time, the growth rate of animals feeding on microscopic algae was determined.

Bacteria were shown to form special agglomerations, important as a food component for small marine animals. Previously, bacterial cells were not considered food because of their miniscule size; to explain their role in plankton, the scientists measured the amount of energy transferred from one food level to another.

Plankton Research

Intensive plankton research was conducted with special nets, bathyphotometers, and radioisotopes to determine photosynthesis intensity. This research yielded for the first time a detailed picture of the vertical distribution of plankton.

Large, stable accumulations of animals, microorganisms, and detritus were discovered at several dozen meters. These perform important functions in the life of the ocean's upper layers.

The collections will be used to design a mathematical model of vital links between marine animals, and to compile a generalized 'biological productivity map' of the ocean. ('Izvestiia,' Feb. 20.)

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THE SUGGESTION BOX PROVES VALUABLE FISHING GEAR

The Soviets have suggestion boxes and know how to use them. The Sevastopol Trawler Fleet Administration received 154 suggestions during first-half 1968; the 118 adopted saved thousands of rubles.

USSR (Contd.):

One suggested a continuous production line for gutting, filleting and packing fish. Installed aboard a BMRT, it saved 50,303 rubles (US$55,300) during one trip. A suggestion that various repairs be performed at sea, without docking, saved 6,168 rubles (US$6,785) per vessel. ('Rybnoe Khosiaistvo,' Feb.)

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VESSEL STUDIES FISHERIES OFF SENEGAL

Soviet scientists on the research vessel 'Blesk' of the Atlantic Research Institute for Fisheries and Oceanography have conducted a joint survey with Senegalese scientists off West Africa. The survey was made to assess the fisheries, and to recommend measures to utilize, conserve, and expand fishery resources.

This was the first joint USSR-Senegalese scientific fisheries exchange. Joint cruises and expanded exchanges of scientific personnel are planned. (TASS, Mar. 16.)

U.S. Groundfish Survey

The Blesk, on her maiden cruise during Sept-Nov. 1968, participated in a joint U.S.-USSR groundfish survey under the Mid-Atlantic Fisheries Agreement. The survey, conducted from BCF's Biological Laboratory at Woods Hole, Mass., covered an area from the Gulf of Maine to Cape Hatteras.

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EXTENDS SEAWEED AGREEMENT WITH JAPAN

On April 14, 1969, after only 3 days of negotiations, the Soviets signed an extension of the "private" seaweed-collection agreement with Japan. The Japan Fisheries Association President (Nakabe) signed for Japan; the Acting Director of Commercial Fishing Division, Ministry of Fisheries (V. Lipanov) for the USSR. The Soviets first concluded this agreement (also known as "kelp agreement") in 1963 at Japan's insistence; they have extended it every 2 years.

The 1969 Agreement

In the past, the Japanese were permitted to deploy 300 seaweed-collecting vessels in the Straits of Nemuro, off northeast Hokkaido, in areas the USSR claims as territorial waters. In 1969, Japanese will be allowed to deploy 330 vessels. Also, each Japanese fisherman will be permitted to catch 10 kilograms of fish daily for his own food. As compensation, the Soviets will require each Japanese vessel to pay a fee of 12,000 yen (US$33) per year.

The fees demanded, about $11,000 a year, are low compared with value of 1963 seaweed harvest estimated by Japanese at US$800,000. (No recent estimates are available.)

Norway

FISHING OUTLOOK IS PROMISING

The short-term outlook for Norway's fishing industry is promising. Total catches of cod and other groundfish in the major fishing districts (Sogn of Fjordane through Finnmark) reached 118,500 metric tons in first-quarter 1969--22% above same period 1968. High-quality spawning cod and Finnmark young cod provided 82,500 tons, a remarkably high proportion of the catch. Continuing good market conditions for frozen fillets were reflected in the more than 40% increase in fish purchases (to 57,000 tons) by the frozen-fillet industry.

Stockfish

There were no prospects for early resumption of stockfish sales to Nigeria, the traditional market for about 70% of Norway's stockfish. But raw fish supplies for hanging (stockfish) increased over 25% to 31,700 tons in first-quarter. This reflected both low prices and demand for salted fish, mainly klippfish, and state purchases and guarantees for stockfish production.

Inventories

On Dec. 31, 1968, stocks on hand of frozen fillets and stockfish were 18,000 tons and 8,400 tons, respectively. Frozen-fillet stocks were about 20% above, and stockfish inventories about 10% below, normal levels.

Norway (Contd.):

Exports of Frozen Fillets to U.S.

Recorded shipments of frozen-fish fillets to the U.S. in Jan.-Feb. 1969 corresponded to over 33,000 tons on annual basis. According to Frionor's sales director, the U.S. frozen fish market is growing at a 10-20% rate.

Industrial Fishery

Reduction plants received about 446,000 tons of raw material during first quarter, slightly more than year before. The complete failure of the winter herring fisheries was offset by a good capelin fishery off Finnmark. Prospects for the rest of 1969 will depend on development of North Sea mackerel and herring fisheries, the small and fat herring fisheries, and a possible reappearance of capelin.

Competition for Fish Meal

Fish meal industry spokesmen have voiced concern over planned EEC subsidization of surplus stocks of dehydrated skimmed milk. Reportedly, such stocks are well above combined Norwegian-Danish annual fish meal sales in EEC area. It is believed that marketing such quantities of dehydrated milk for animal food will result in a cutback in EEC demand for Norwegian fish meal.

The fish meal industry also is concerned about the potential price-lowering effects stemming from construction of central warehouses in Europe by Peru. These warehouses will be supplied by large bulkships. (U.S. Embassy, Oslo, Apr. 25.)

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SUPPORT TO FISHERIES RISING

A major aim of the General Agreement of June 3, 1964, signed by the Ministry of Fisheries and the Norwegian Fishermen's Union, was to end state support to the fisheries in the near future. The steadily increasing subsidies granted since then indicate no progress has been made.

Total state support payments to the industry reached US$37.7 million in 1968. This included $7.8 million for state purchases of stockfish from producers/exporters. State support to the fishermen was 20.4% of 1968 exvessel catch value, compared with 16.8% in 1967.

Norway Criticized

Although the support system includes no direct export subsidies, Norway has been criticized lately, notably by Britain, for keeping export prices artificially low through subsidies.

Norway's support system also makes Denmark's unsubsidized industry wary of the Norwegian demand for a free NORDEC market for fishery products. (U.S. Embassy, Oslo, Apr. 25.)

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1968 FISH BODY OIL OUTPUT FELL

In 1968, raw material supplies for fish meal and oil-reduction plants were about 20% below 1967. Production of fish body oils shrank correspondingly to 240,000 metric tons; 1967 production was 327,000 tons. Production of fish-liver oils increased from 10,500 to 11,000 tons.

Production of Oils from Fish and Marine Animals

Commodity	1967	1968
	. . . . . (Metric Tons)	
Fish-liver oils	10,500	11,000
Fish-body oils	327,000	240,000
Total fish oils	337,500	251,000
Sperm oil:		
Antarctic	4,523	429
Shore stations	181	9
Total sperm oil	4,704	438
Seal oil	2,300	1,500
Whale oil:		
Antarctic	13,661	5,396
Shore stations	192	468
Total whale oil	13,853	5,864

Pelagic Whaling Stops

Since Norway will no longer participate in Antarctic whaling, the fish off her coast will be the main source of marine oils. Only one Norwegian whaling expedition took part in the 1967/68 season, the last Norwegian pelagic-whaling season. Limited whaling is still carried on from 2 land stations in Norway.

Imports & Exports

Reflecting lowered fish oil production and dimished returns from whaling, fish oil imports increased from 23,022 tons in 1967 to 43,791 tons in 1968. More than one-half came

Norway (Contd.):

from Peru. Exports of fish oils dropped from 190,777 tons in 1967 to 115,726 tons in 1968--about same as 1966.

	1968	1967	1966
	. . . . . (Metric Tons)		
United Kingdom	39,311	34,819	32,100
Sino-Soviet	22,834	23,161	48,438
Others	24,045	23,645	25,138
Total	86,190	81,625	105,676

Exports of hardened marine oils increased by about 5,000 tons to 86,190 tons as a result of larger shipments to Britain. (Sources: Directorate of Fisheries, Bergen, 'The Norwegian Whaling Gazette,' and Ministry of Fisheries, Oslo--U.S. Embassy, Copenhagen, Apr. 15.)

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INTERNATIONAL CONSERVATION EFFORTS

Norway has not publicized any official policies regarding international efforts to conserve northeast Atlantic fish resources. Indications are, however, that she favors a national quota system for groundfish in the Barents Sea, regulatory measures for North Sea herring and mackerel fishing, and a ban on salmon fishing in international waters. All these issues were on the agenda of the May ICNEAF meeting in London.

Ban on Driftnets

The recently imposed ban on driftnets (gillnets) inside Norwegian fisheries limits reflects government recognition of the need to preserve the North Atlantic salmon stock. Minister of Fisheries Einar Moxnes has said that banning driftnets in domestic waters would give weight to Norway's support of a complete ban on salmon fishing in international waters.

Government's Efforts Backed

The government's salmon conservation efforts are fully supported by marine scientists and salmon fishing interests. Norwegian landowners have had exclusive salmon fishing rights in the rivers and along the seacoast for hundreds of years. Drift-netting dates back only to the beginning of the 1960s. (U.S. Embassy, Oslo, Apr. 25.)

Denmark

FISHERY EXPORTS IN 1968 SET RECORD

Danish exports of fishery products during 1968 were worth a record US$133 million. Compared with 1967, pond-trout exports increased almost 15% in quantity and 11% in value; exports of cod fillets and blocks rose 10% in quantity and 14% in value.

Foreign Markets

Common Market countries continued as the leading market, although Denmark's EFTA partners bought only slightly less. Exports to East Bloc countries increased 25%. Exports to the U.S. were up about 25% over 1967, primarily because of increased sales of cod fillets and blocks.

Faroese Exports

Total fishery exports from the Faroe Islands amounted to $19.2 million in 1968, a 17% decline from 1967. Reductions in sale of salt fish accounted for much of the decline. Exports of frozen fillets and blocks to the U.S. declined 25%, but the U.S. still was the largest buyer. (U.S. Embassy, Copenhagen, May 1.)

Iceland

WHITE FISH CATCHES INCREASE

In 1968, there was greater fishing effort for the more valuable white fish sector--cod, for example. It produced a recovery in the white fish catch; it promises an even greater catch in 1969. This was due partly to fishing vessels and fishermen, previously lured to herring fishing during the boom years, returning to the white fish fishery.

Processing of fish has been directed increasingly to products commanding a higher export value--and to the best market prospects. More profitable use results in larger volume of processed frozen white fish for export, and more labor-intensive methods favorable to employment. The almost complete loss of Iceland's stockfish (air-dried cod) market in Nigeria in the past 2 years cut production and export. So better quality raw material is being shifted into freezing and salting.

Iceland (Contd.):

1969 Outlook

Outlook for herring will not be discernible until early fall. This is because of changed migratory behavior of herring and smaller stocks. White-fish production for 1969 is expected at least at 1968 levels. Despite 6-week strike by fishermen that began Jan. 1969, the major cod-fishing season ending in May was bringing catches above 1968. For the first 3 months of 1969, cod catches increased 38% over 1968. The low-value spring capelin catches were reaching records. By end of March 1969, catches had more than doubled over 1968 period.

The value of export production is yet to be determined by price movements abroad. These appear favorable. Supply conditions in the U.S., particularly for frozen fish, may well determine trends. The U.S. is Iceland's leading market, followed by Great Britain and USSR in 1968. Salt-fish markets are shrinking. (U.S. Embassy, Reykjavik, May 8.)

* * *

CAPELIN MEAL SELLING WELL

In 1965, when Icelanders started catching capelin on a large scale, exporters had trouble selling capelin meal to certain countries. Some buyers did not know capelin. Capelin meal, being more fatty than herring and cod meals, does not sell as well. Despite occasional sales difficulties, capelin meal usually sold at fair prices in 1965-1968.

Production & Prices in 1969

The initial problems were largely overcome in 1969, and sales have been excellent. They have been helped by the recently favorable market for fish meal. Iceland's 1969 capelin meal production will be about 25,000 tons, and average c.i.f. prices about IKr. 13,650 a ton.

Capelin Meal Exports & Average Prices

	Exports	Average f.o.b. Price
	Metric Tons	IKr./Metric Ton
1968	11,243	6,360
1967	15,756	6,070
1966	19,185	6,480
1965	6,480	6,620

Note: IKr. 57.07 = US$1 in 1968, IKr. 43.06 = US$1 in 1967, 1966, and 1965.

Polish Purchases

The Poles have been large buyers of herring and cod meals in recent years. Efforts to get them to buy capelin meal were in vain until recently--when a Polish feed-blending specialist visited. Then Icelanders succeeded in selling Poland a 250-ton sample shipment of capelin meal at acceptable prices.

Largest Buyer Is Denmark

The Danes have purchased the lion's share of this year's capelin meal production, both for domestic use and for reexport. They have a more favorable sales position than the Icelanders. They do not have to pay a 10% import duty on fish and capelin meal in Britain because of Denmark's EFTA membership. (U.S. Embassy, Copenhagen, May.)

Sweden

AMERICAN CRAYFISH WILL BE PLANTED IN LAKES

The Swedish Fisheries Directorate has announced a US$40,000 appropriation to introduce American "signal" crayfish into 60 lakes. It is an attempt to replace Swedish stocks of the European river crayfish (Potamobius astacus). These stocks had been decimated by a virulent fungus disease that first struck in 1907.

Successfully Tested

The American "signal" crayfish, imported for testing from Lake Tahoe in Nevada and California, proved easily transplantable under Swedish conditions. It is said to be a thousand times more resistant to the fungus disease than the river crayfish. The "signal" crayfish is aggressive, reproduces rapidly, and may compete effectively enough to reduce river crayfish stocks even further. Therefore, introductions will be made under closely controlled conditions. The lakes selected for planting have at least 20 acres of surface area and had sustained good stocks of river crayfish before the disease struck.

A Delicacy in Northern Europe

The Swedes and other North Europeans relish fresh-water crayfish, eating them with

Sweden (Contd.):

aquavit (1 tiny glass with each claw and 2 with the tail). Taste tests, presumably under standard conditions for crayfish eating, have shown that American "signal" crayfish has a flavor equal to the native variety.

Market Opportunities

The commercial market for crayfish in Sweden and Denmark lasts only a short period. It exists primarily during August, when many people are on vacation. Many crayfish consumed in Sweden and Denmark are imported from Turkey and Bulgaria. The U.S. Embassy in Copenhagen has received occasional inquiries regarding U.S. suppliers of fresh live crayfish.

* * *

LICENSES SHRIMP IMPORTS

The Swedish Agricultural Marketing Board decided that all cooked-shrimp imports were subject to license approval, effective March 1, 1969. The decision was made to give the Board an opportunity to follow the level of imports and price development.

Requiring a license for imports does not mean automatic limitation. Imports will be readily licensed unless the level of imports and prices become problems. The license procedure will give the Board a chance to step in rapidly if import limitation is considered necessary.

Addition of coloring to shrimp imports also will be prohibited, effective July 1, 1969. (U.S. Embassy, Mar. 3.)

* * *

EXTENDS DEADLINE
ON COLORING SHRIMP

Sweden will permit coloring of shrimp until Jan. 1, 1970. Previous deadline was July 1, 1969.

After Jan. 1, 1970, coloring will be prohibited except for peeled and deep-frozen shrimp packed in closed original containers. The label must contain a statement that shrimp have been colored. (U.S. Embassy, Stockholm, Apr. 29.)

Spain

1968 WAS GOOD YEAR FOR
CANNED FISH INDUSTRY

Fish canning, one of the more important sectors of Spain's food industry, has resumed its growth. It had experienced a sharp reduction in output in 1966 after a peak in 1965. The value of fish canning in 1968 surpassed 1965's high.

The industry produces primarily canned fish packed in oil, about 70% of output, and canned marinated fish, about 10%. Production centers are in the 4 northwest provinces that form Galicia. The more important canners operate in and around Vigo in Pontevedra province.

World Market

Of equal significance is the canned fish industry's performance in the international market. Exports in 1968 grew to about US$18 million, a 27% increase over 1967. Canned sardine and anchovy sales are the largest share (about 64%) of exports. Tuna, bonito, and albacore are next largest.

Resumed expansion in domestic and export markets points to possibility of increasing opportunities for U.S. manufacturers of processing and packaging equipment for domestic producers. (U.S. Embassy, Madrid, May 7.)

United Kingdom

1968 FISH MEAL USE
ROSE 100,000 TONS

Fish meal consumption in the U.K. last year increased by more than 100,000 tons over 1967 to a record 582,000 long tons. Domestic meal production, boosted by larger amounts of unsold fish in Hull and Grimsby, rose 7,000 tons above 1967, to 87,000 tons.

Imports

The rest of the supply--495,000 tons worth US$70.3 million--was imported ($54.7 million for 395,450 tons in 1967 and $50.8 million for 308,500 tons in 1966). Total supply in 1967 was 475,450 tons; in 1966, 394,500 tons.

United Kingdom (Contd.):

Fish Oil

In 1968, fish oil imports dropped from 281,900 tons worth \$36 million in 1967 to 265,000 tons valued at \$28.1 million. In 1966, oil imports of 177,800 cost \$29 million.

On a yield basis of 4 to 5 tons of fish for a ton of meal, British imports represented a catch of over 2 million tons. ('Fishing News,' Mar. 7.)

East Germany

CONDUCTS OCEANOGRAPHIC RESEARCH IN BALTIC

Early in March 1969, East Germany's oceanographic research vessel 'Prof. Albrecht Penck' sailed on the first of 4 Baltic research voyages scheduled for this year. This is part of the program for International Baltic Sea Year 1969-70. It is being carried out by the Institute of Oceanography of the East German Academy of Sciences. The research is financed in part by the East German High-Seas Fisheries Administration.

Research Procedures

Measurements and chemical-biological samples will be taken at 14 locations. The sea's temperature, salt content, water density, and "production potential" will be measured. According to a 1968 agreement, the participants will exchange data to lay the groundwork for development of fishing in the Baltic.

Increasing Pollution

Another research objective is to develop methods of fighting pollution. Recent observations by the East German Institute of Oceanography at Rostock-Warnemuende have disclosed that pollution of the Baltic due to more organic matter has increased over the last decade. This matter is soaking up dissolved oxygen and threatening marine life. (U.S. Mission, Berlin, Mar. 18.)

Czechoslovakia

IMPROVES FISH-CULTURE TECHNIQUES

The Department of Fish Culture and Hydrobiology, University of Brno at Bano, has increased fingerling production from 200-500 kilos/hectare to about 1,000-1,200 kilos per hectare by improved culture techniques. Attempts are being made to increase production of table fish to 1,500 kilos/hectare by judicious fertilization of the ponds, and an optimum ratio of natural and artificial feeding. ('FAO Fish Culture Bulletin,' vol. 1, no. 2, Jan.)

Poland

FISH CULTURE IS GROWING

Salmonid culture is expanding in Poland, particularly the pond culture of rainbow trout, Salmo gairdneri. Atlantic salmon, Salmo salar, were introduced into rivers in April 1968. Eyed eggs of this species came from Canada.

Poland's annual harvest of common carp from ponds is about 12,300 metric tons. Total inland fishery production is 20,600 tons. Common carp is selected systematically for fast growth rate and delayed maturation.

Carp Culture

Monoculture of common carp is widely practiced, but other species--like tench and grass carp--are being stocked increasingly to achieve higher yields. Based on experiments conducted by the Inland Fisheries Institute at Zabieniec, commercial culture of grass carp, silver carp, and common carp is recommended. ('FAO Fish Culture Bulletin,' vol. 1 (2), Jan. 1969.)

* * *

Economic Returns to Polish Factory Trawlers in Northwest Atlantic

Bruno G. Noetzel

The Northwest Atlantic has the world's richest resources of food fish; it is also the most exploited part of the ocean. Fishing effort increases year after year. The pressure has accelerated with introduction of new fishing techniques--and transfer of fish-processing activities from land to fishing grounds via factory ships.

Large fleets of modern stern-ramp trawlers operate year round. The vessels are equipped with highly mechanized fish-processing facilities: freezing, fish meal, and fish oil plants, and refrigerated holds for frozen products. They are capable of converting the entire catch into final marketable products: frozen fillets in blocks, fish meal, and fish oil.

These huge fishing and processing vessels, built entirely with state funds, are representative of the direction of fishery development in most of the Eastern European countries in the past 10 years.

What the Vessels Look Like

On Oct. 22, 1960, the Gdansk Shipyard delivered the first in a series of these modern fishing vessels to Poland's state-owned fishing industry. By the end of 1965, twelve factory trawlers of the type described below were in operation, all managed by "Dalmor" Deep-Sea Fishing Enterprise in Gdynia.

The all-welded, steel-hull vessels have these main characteristics: length overall 85.20 m, moulded breadth 13.80 m, depth to shelter deck 9.75 m, gross tonnage 2,800, net tonnage 1,160. A Sulzer-Zgoda model 8TD48 diesel engine developing 2,400 h.p. at 180 r.p.m., is coupled to a 4-bladed 3.10 m diaameter Lips controllable pitch propeller to give a cruising speed of 11.5 knots.

Auxiliary machinery includes four 250 kW generators driven by Sulzer 6BAH22 diesels, each 375 h.p. at 500 r.p.m. The standard crew is 94 men, but there are accommodations for 102. The vessels can stay at sea 70 days without refueling.

The processing plant is equipped with filleting machines for redfish (Baader 150) and for cod (Baader 99, and on a few vessels a Baader 38 also), heading machines (Baader 412), skinning machines (Baader 46 and 47), and washing machines (Baader 666). There are two filleting lines (on some vessels there is an additional line for small cod), and 9 stands for filleting by hand (for larger fish). The total capacity of the processing plant is 50 m. tons of fish every 24 hours.

Fish fillets, dressed fish, and whole fish are quick frozen in 2 blast freezers with a total capacity of 30 m. tons of products per 24 hours. The frozen fish blocks are stowed in 3 refrigerated holds (total volume 1,433 cubic meters). The fish meal plant can handle 20-30 m. tons of offals and by-catch per 24 hours. Fish meal packed in 50 kg. sacks is stowed in a 285 cubic m. hold (the storage capacity is 600-650 kg./cu.m).

Up to one ton of liver oil can be produced daily from cod livers. Fish oil is also obtained as a by-product of fish meal production. Four tanks with a total volume of 58 cubic m. provide storage space for the oils (approximately 53 m. tons of oil).

How They Are Operated

During the 5-year period 1961-1965, these vessels made 75 trips (a total of 27.75 vessel-years were analyzed) to the Northwest Atlantic fishing grounds (International Commission for the Northwest Atlantic Fisheries

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Note: Tables 1 and 2 and figure 6 are in the appendix in reprint (Sep. No. 842) of this article. For a free copy of the Separate, write to Division of Publications, U.S. Department of the Interior, Fish and Wildlife Service, BCF, 1801 N. Moore St., Arlington, Va., 22209.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 842

(ICNAF) Convention Area) and only 2 exploratory trips to the African shelf.

On the average, a vessel was at sea 270 days per year; the balance in ports and shipyards. The vessels spent an average $16\frac{1}{2}$ days in domestic ports between trips.

Running to and from the fishing grounds required 23.5% of time at sea, or 17.4% of a year's time (Figure 1). On the fishing grounds, about 75% of the time was used for fishing activity, including: setting and hauling of trawl, trawling, and gear repairs (Figure 2).1/

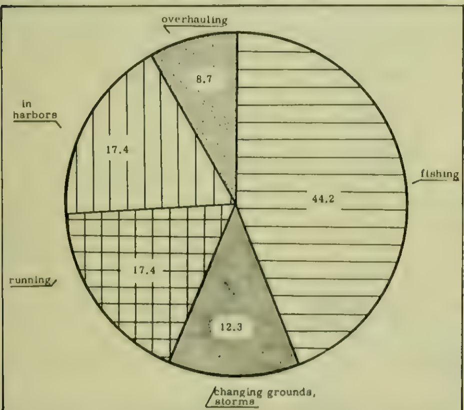


Fig. 1 - Average use of annual vessel time, 1961-1965 (in percent of a year's time).

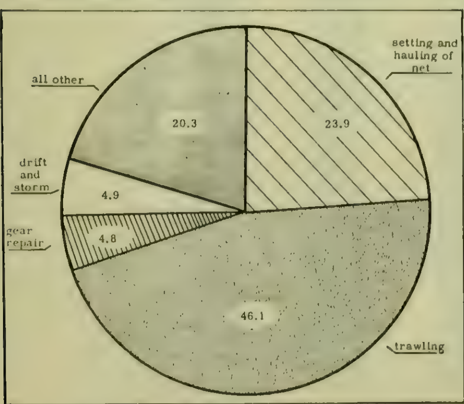


Fig. 2 - Breakdown of time spent on fishing grounds (in percent, 5-year averages).

Because of the long distance between home ports and grounds fished, the vessels were able to complete an average of only 2.77 trips a year. The average fishing activity per trip was 58 days (one day = 24 hours of fishing activity). The vessels averaged 496 hauls and 860 hours of trawling during the 58 days.

On 2 trips to the African grounds, 4,355.3 m. tons of fish were caught (or 2,178 m. tons per trip). The average catch from 75 trips to the ICNAF area was 1,676.5 m. tons.

The production of these factory trawlers may be looked at from 2 viewpoints: What is this production relative to total landings by the entire Polish fishing fleet? What are the effects of this additional fishing pressure on the resources in the ICNAF Convention Area?

In 1965, the Polish fleet represented 11 vessel-years of operations--10 vessels were operated all year, and 2 joined fleet during year. This fleet caught 52.2 thousand m. tons of fish in the ICNAF area. It accounted for 18.6% of total landings by entire Polish fishing industry. This quantity is a significant portion of Polish landings, but it is only 1.6% of 1965 landings by all countries in ICNAF area.

Over the 1961-1965 period, the catch by Polish factory trawlers from ICNAF area (125.7 thousand m. tons) was 0.9% of all landings.

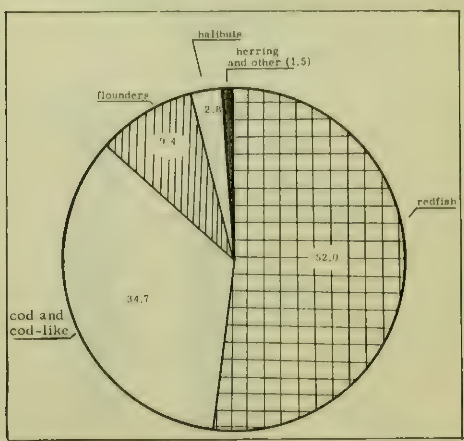


Fig. 3 - Composition of catch from ICNAF area (in percent of total).

1/"All other" in Figure 2 includes: changing grounds, short calls to foreign ports (without time for unloading or repairs), running to and from these ports (mainly St. John's, Newfoundland).

The composition of catch from ICNAF area is shown in Figure 3. The total catch of 130,095 m. tons (5 years' production, Africa and ICNAF area combined) was processed aboard vessels into 68,959 m. tons of fish products. From ICNAF area alone, 66,402 m. tons of fish products were landed in these forms:

	Percent of Total by Weight		
Frozen redfish fillets	23.46		
frozen cod fillets	15.55		
Total frozen fillets		39.01	
Frozen fish, dressed		34.13	
Frozen fish, gutted		0.05	
Frozen fish, whole		1.99	
Other frozen products		0.15	
Total frozen products			75.33
Fish meal			20.03
Fish oils			4.64
Total landings			100.00

About 10% of total production was landed in foreign ports. These landings consisted of:

6,066.1 m. tons of frozen products
550.1 m. tons of fish meal
11.1 m. tons of fish oils

Out of these quantities 1,618.7 m. tons of frozen products were landed in Africa, the remainder in Canada.

The balance of total production was brought into domestic ports. The 5-year average load in those landings was 853 m. tons of fish products. There was a significant increase in landings per trip over time (Figure 4).

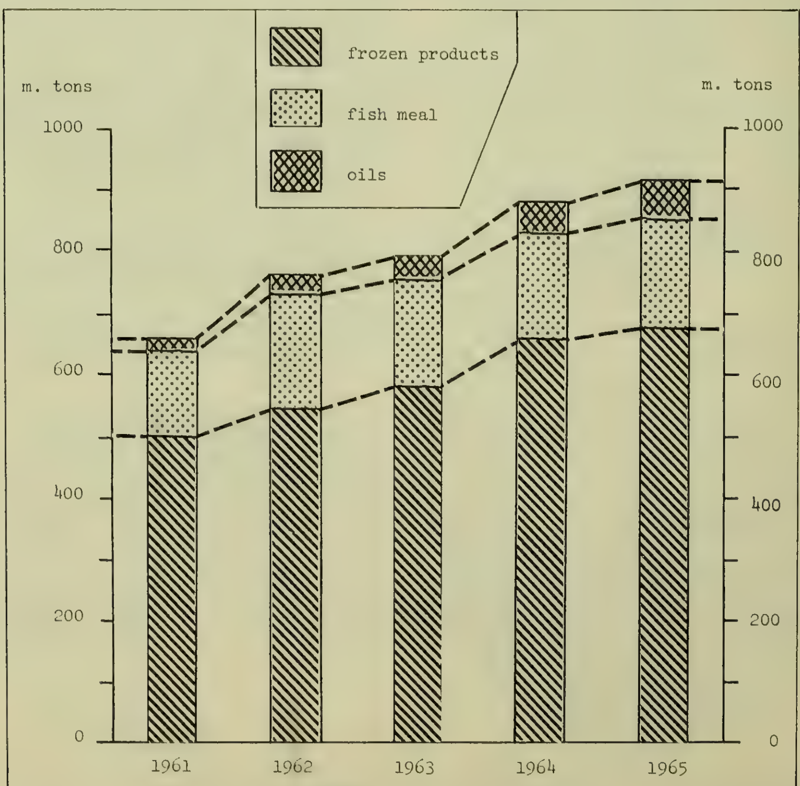


Fig. 4 - Per-trip landings in domestic ports, 1961-1965.

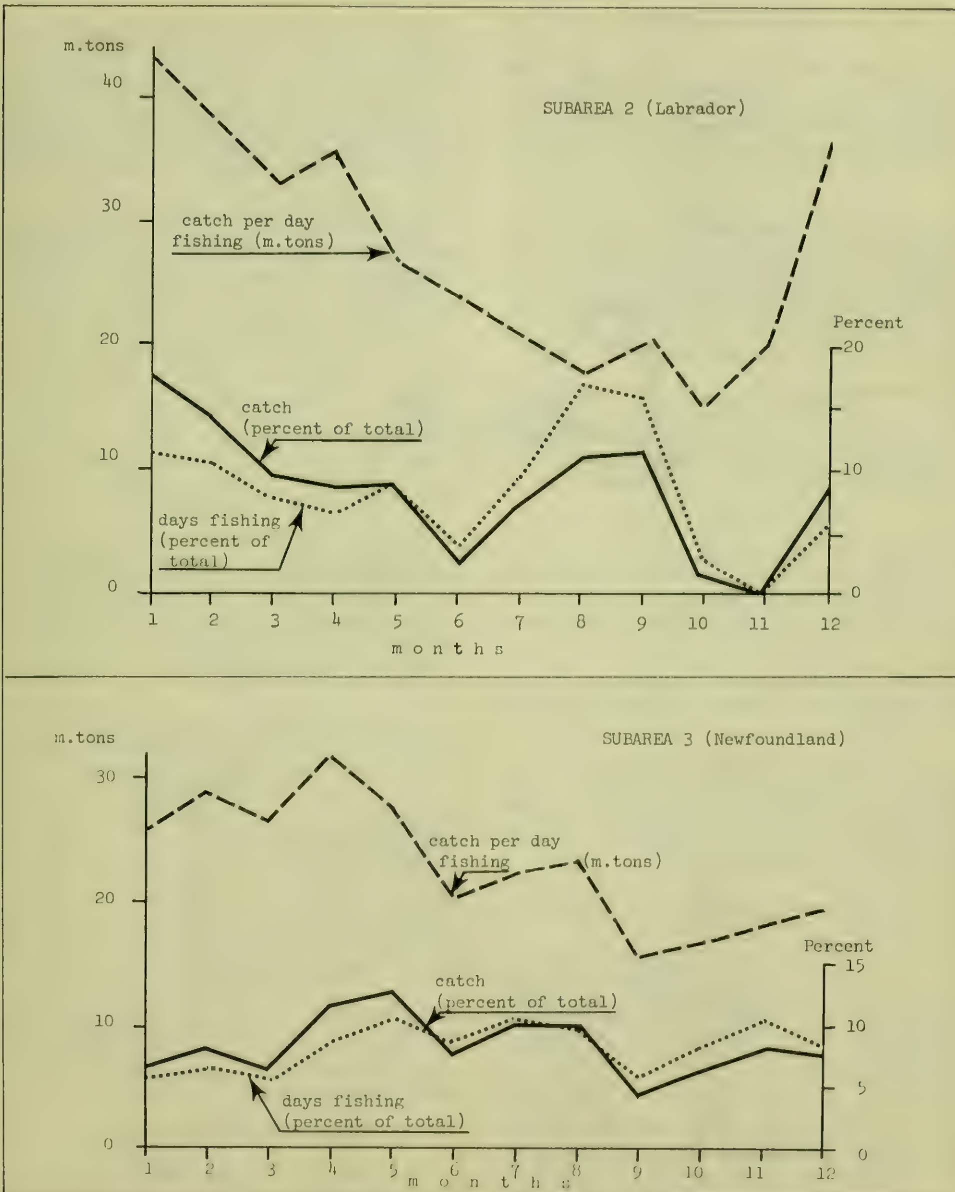


Fig. 5 - Monthly distribution of effort and catch in two ICNAF subareas.

Catch Per Effort

The catch from ICNAF area per vessel and year increased from 2,669 m. tons in 1961 to 4,748 m. tons in 1965. This resulted partly from increased effort and partly from increased fishing efficiency as can be seen from the data in Table 1 (in appendix).

Fishing in the Northwest Atlantic was mainly in 2 subareas (ICNAF notation): sub-area 2 (Labrador), and sub-area 3 (Newfoundland). These accounted for 97.3% of the vessels' total catch from ICNAF area. The remainder (2.7% of total) comes from sub-area 1 (Greenland), sub-area 4 (Nova Scotia), and sub-area 5 (Georges Bank).

The highest catch rates in sub-areas 2 and 3 prevailed from December through May (Figure 5). These higher rates coincide generally with high share of species other than redfish in the catches (Figure 6 in appendix).

Costs and Earnings

Gross revenue from fishing is derived from 2 sources: the equivalent of U.S. dollars in Polish currency (zloties) for products occasionally sold in foreign ports; and the value of fish products landed in domestic ports.

The conversion rate is set arbitrarily by Narodowy Bank Polski, the State's Central Bank.

Gross revenues and operating costs were taken from accountants' statements. Since no data on management and administration costs were provided, this cost item (indicated as overhead cost) was estimated by the author as 15% of operating costs.

The returns of an average factory trawler for 1963 through 1965 were:

	1963	1964	1965	1965
	. . . . (1000 zloties)			$1000
Gross revenue	45480.2	48344.7	47376.6	853.3
Operating costs	34392.0	32645.0	29273.0	527.4
Overhead (15%)	5158.8	4869.8	4391.0	79.1
Gross profit	5929.4	10829.9	13712.6	246.8
Return on investment (percent)	5.5	10.0	12.7	8.8

The dollar values in the last column give the U.S. reader an idea about the magnitude of values. The reader is cautioned against drawing conclusions from these figures. Without any valid and meaningful rate of exchange in existence, the dollar values were approximated in the following way: the U.S. wholesale price for imported frozen cod fillets in blocks (over 10 pounds each) at 24.4¢ per pound (average for imports from 12 countries in 1965) was applied to quantities of cod fillets landed by the factory trawlers in 1965.

Prices in dollars for other frozen fish landed were then derived by maintaining the same proportions to cod fillets price in price list on which crew wages are based. For fish meal and oils, the average 1965 U.S. wholesale prices were used.

The result of these calculations is the gross revenue value of 853.3 thousand U.S. dollars, indicating an overall conversion rate of 55.50 zloties to 1 U.S. dollar. The same conversion rate was then used to calculate costs. The conversion rate for frozen products alone is 54.10 zloties; for fish meal and oils, 64.50 zloties to 1 U.S. dollar.

The rate of return was calculated by relating gross profits to vessel's replacement value--approximately 107.7 million zloties, or 2.8 million dollars. The replacement value in U.S. dollars is an estimate based on comparable construction costs of the U.S. factory trawlers 'Seafreeze Atlantic' and 'Seafreeze Pacific' if built in Europe.

The composition of operating costs is exemplified here by the 1965 costs per vessel:

	1000 zloties	Percent of Total
Fuel and oils	4543	15.52
Fishing gear	3908	13.35
Packing and other materials	2467	8.43
Crew wages & payroll taxes	8309	28.38
Groceries & provisions	1835	6.27
Repairs	1310	4.48
Insurance	1219	4.16
Harbor & other fees	87	0.30
Depreciation	5003	17.09
Other costs	592	2.02
Total operating costs	29273	100.00

With prices for fish products fixed by government, the effectiveness of invested capital (rate of return on investment) depends largely on government's economic policy toward fishing industry.

Competition for U.S. Factory Trawler

The first U.S. factory trawler, the Seafreeze Atlantic, is on her maiden trip to the

Northwest Atlantic fishing grounds. The U.S. and Polish vessels have many similar features (Table 2 in appendix). A long time span divides the first trials of the European and U.S. fishermen in modern fishing technology. Experience has to be gained before full results of fishing with the new vessel can be expected.

The setup of processing machinery (Table 2) indicates that the U.S. and Polish vessels are designed to exploit the same species (cod and redfish stocks). The experience of Polish factory trawlers gives cause for optimism about the eventual achievements of the Seafreeze Atlantic. The proximity to the fishing grounds favors U.S. vessels in reduced running time and higher proportion of effective fishing time per year.

A broader report on Polish fishing vessels is in: "A Report on the Economics of Polish Factory Trawlers and Freezer Trawlers," by Bruno G. Noetzel. It is based on data provided by the Sea Fisheries Institute, Gdynia, Poland, under a contract with BCF.

Acknowledgments

I thank Dr. Adam A. Sokoloski and Dr. Frederick W. Bell for their valuable comments, and Frank Murray for preparing the graphs.

LATIN AMERICA

Peru

ANCHOVY SEASON CATCH LIMITS AND CLOSURE ANNOUNCED

In mid-April, Peru announced a 9.5 million-metric-ton limit on anchovy catch for the 1968/69 season. The season began Sept. 1, 1968. This is the same limit as in the 1967/68 season; it is 1.3 million tons more than the 8.2 million ton provisional catch announced in January.

Closure Dates

On May 13, the Minister of Agriculture announced that the 1968/69 season would close May 31. By then, the 9.5 million quota was expected to be reached. Fishing will remain closed for 90 days, except for southern ports of Ilo and Mollendo. The 1967/68 season had closed at the same time and for the same period.

Previous Suspensions

The 1967/68 season did not begin until October 1967. A strike had prevented fishing in September. Fishing was suspended Feb. 17-Mar. 17, 1968, and again during Feb. 1969.

Production and Exports

This season's fish meal production through February was 1,113,196 tons; it was 1,211,114 tons for same period 1967/68. March production was apparently the highest of any month in the history of the fishery. Exports continued high compared to previous years, but stocks on hand were below previous levels. On April 24, prices for fish meal c. & f. Hamburg had reached US$159 a metric ton (deliveries through Dec. 1969).

Fish Meal Production and Exports, First Quarter, 1967-1969

	1969	1968	1967
	. . . . . (Metric Tons)		
Production:			
Jan.	240,495	284,021	287,466
Feb.	17,357	191,575	109,644
Mar.	325,549	155,233	163,512
Total	583,401	630,829	560,622
Exports:			
Jan.	140,283	192,056	100,281
Feb.	185,938	188,222	115,673
Mar.	188,225	170,107	117,282
Total	514,446	550,385	333,236
Stocks on hand Mar. 31	449,652	671,323	596,275

Although production is somewhat unpredictable, April will be a record for that month if the catch of the first two weeks is an indicator. Whether the 9.5 million ton limit will be observed or increased is uncertain. (U.S. Embassy, Lima; 'Sociedad Nacional de Pesqueria,' Apr. 21 & 22.)

Cuba

RECEIVES SHRIMP TRAWLERS FROM EUROPE

Cuba has received 74 shrimp trawlers of the 90 ordered from Spain. The remaining 16 should be delivered during the coming months. The vessels are being built by a consortium of 6 Spanish shipyards, most at Vigo.

The steel-hulled 107-gross-ton trawlers are 23 meters (77 feet) long overall, can travel 10 knots, and carry a crew of 11. Their fuel tanks hold 40 metric tons and the water tanks hold 15. The nonrefrigerated holds are about 80-cubic-meter capacity each.

30 Ordered from France

Cuba has ordered thirty 25-meter-long (82 ft.) refrigerated vessels from France. They will have a 50-ton frozen storage capacity and brine tanks to preserve 4,000 pounds of shrimp. Cuba may pay with spiny lobster sales. During the last quarter of 1968, France imported 540 metric tons of Cuban crustaceans, mostly spiny lobster, worth US$1.45 million.

ASIA

Third Asian Tuna Conference Held

The third Asian tuna conference was held in Seoul, S. Korea, April 22-23, 1969. It was attended by representatives from Japan, S. Korea, Taiwan, and Okinawa.

The conference covered problems in tuna production, sales and marketing, labor, and administration. The discussions showed growing interest in resource problems. The participants talked less about national interests and more about achieving common goals. Ways were sought to insure stable management and fishery growth.

Agreements Reached

Agreement was reached on the following:

(1) The delegates affirmed the need to give due consideration to the tuna resource problem. The delegates will urge their governments to arrange a meeting of fishery scientists--and to promote national participation in International Convention for the Conservation of Atlantic Tunas and other international tuna organizations.

(2) Despite rising costs of fishing vessels, labor, interest rates, and worldwide decline in catch rate, world tuna prices remain low. This poses a serious management problem. Tuna producers must cooperate to assure recovery of production costs and reasonable profits. They must see that a rational price determination is made.

(3) Unilateral extension of territorial waters or fishery jurisdiction over vast areas must be firmly opposed.

(4) A permanent organization, unanimously approved at this year's meeting, will be established.

The next conference will be held on Okinawa in late Feb. 1970. ('Katsuo-maguro Tsushin,' Apr. 28.)

Japan

REGULATES EASTERN PACIFIC YELLOWFIN TUNA FISHERY

The Japanese Fisheries Agency, in accordance with the Inter-American Tropical Tuna Commission's closure of the eastern Pacific yellowfin tuna fishery on Apr. 16, 1969, issued the following instructions:

1) For 1969 only, longliners under 430 gross tons (carrying capacity 300 tons) and purse seiners will be able to fish freely for yellowfin on and after April 16 until combined yellowfin catch after closure reaches the 4,000 short tons allowed Japan. After 4,000 tons, vessels will limit yellowfin catch to 15% of total catch of such vessels.

2) Tuna longliners over 430 gross tons fishing in the regulatory area on or after April 16 would limit yellowfin catch to 15% of total catch of such vessels. ('Katsuo-maguro Tsushin,' Apr. 15.)

* * *

1969 SALMON QUOTA IS 105,000 TONS

The 14th annual meeting of the Japan-USSR Fisheries Commission in Tokyo, April 2-29, set the 1969 Japanese salmon catch quota in Convention waters at 105,000 metric tons. This is 3,000 tons less than in 1967, the previous good year for Asian pink salmon runs; it is the lowest for a good pink salmon year. Of total, 49,750 tons were allocated for Area A (north of 45° N. latitude) and 55,250 tons for Area B (south of 45° N. latitude).

The Soviet coastal quota was set at 80,000 tons.

Much Talk About Herring

At first, the Soviet negotiators sought entry of Soviet patrol boats into Area B and establishment of a "no-fishing zone" between Areas A and B as in 1968. They withdrew demand after strong opposition from Japanese.

The subject of herring fishing was most troublesome; it took up 70% of talks. Both parties agreed to designate "no-fishing zones" in certain areas of Karagin Bay and

Japan (Contd.):

Gizhiga Bay on the eastern and western sides of Kamchatka Peninsula. Japan also agreed to reduce herring fleet to 98 boats (about $\frac{1}{3}$ 1968 fleet) off Karaginski Island, east of Kamchatka Peninsula. ('Suisan Keizai Shimbun,' May 1; 'Nihon Suisan Shimbun,' May 2.)

* * *

REPORT ON DISTANT-WATER TUNA FISHING

In early April 1969, the Japanese tuna fisheries in all oceans, other than eastern Pacific, were generally poor. Catch rates were down for albacore, yellowfin, and bluefin. Up to early April, light catches had caused frozen-tuna prices to rise an average $10-15 a ton on export market. Frozen round albacore exports to the U.S. were around c. & f. US$535 a short ton for direct shipment, and c. & f. US$492 a ton for Atlantic transshipment. Gilled-and-gutted yellowfin exports to the U.S. were quoted at around c. & f. $435.

Pacific Ocean

In the regulatory area of the eastern tropical Pacific, Japanese longliners had been making very good catches of big-eyed marlin and tunas early in March. Catches had averaged 3 tons a day per vessel. Some vessels landed as much as 4 tons per operation.

In the South Pacific, around 10°-15° S. latitude, near American Samoa, yellowfin fishing was good in March. South Korean longliners were catching around 2 tons per vessel, and Japanese vessels close to 3 tons per vessel per day.

In the Tasman Sea, off southeast Australia, modern Japanese vessels concentrated on Australian bluefin fishing. But catches were poor, averaging under 1 ton a day per vessel. There seem to be definite indications of overfishing in the area.

Indian Ocean

Off Fremantle, Australia, fishing had slowed; only a few vessels were there. Longliners had begun converging off the Sunda Islands, Indonesia, to fish yellowfin, big-eyed, and Indian bluefin. Fishing was poor; vessels averaged 1-1$\frac{1}{2}$ tons.

In the Arabian Sea, good yellowfin catches of 3-4 tons a day were being made until mid-March. Fleet operations increased later and landings were cut sharply.

In the western Indian Ocean, north of Madagascar, yellowfin fishing was very slow. The albacore fishery south of the island had not developed fully. Japanese vessels fishing albacore were hoping for a good season starting in late May. However, because of widespread reports of possible current changes in the Indian Ocean, the predominant view was that the fishery does not look promising this year. Most vessels fishing there were catching less than 1 ton a day.

Atlantic Ocean

Around Bermuda, some vessels were fishing with fair success, catching 2$\frac{1}{2}$-3 tons of tuna (mostly albacore) per day. West of the Azores, some vessels were catching 2-2$\frac{1}{2}$ tons of albacore per day.

In the Guinea Gulf, the yellowfin season was under way, but fishing was slow. Many vessels were landing under 2 tons per set. Off Angola, longliners were taking 1-1$\frac{1}{2}$ tons of albacore per vessel per day, but fish quality was far poorer than last year. ('Suisan Tsushin,' Apr. 9.)

* * *

TUNA SEINERS DOING POORLY IN E. PACIFIC

The 4 Japanese purse seiners fishing in the eastern Pacific yellowfin tuna regulatory area for over 2 months are doing poorly. Their catch as of April 10 was only about 200 tons. In view of the good performance of U.S. seiners, Japanese opinion is that there is no reason why their fishermen cannot take more fish. Some observers attribute the poor fishing to extremely slow detection of schools.

Better Communications Needed

Until last year, Japanese longliners in the eastern Pacific intercepted messages between U.S. seiners. This helped produce better catches. This year, interception has become impossible because U.S. seiners have changed messages in reporting fishing conditions due to Japanese entry into regulatory area. Therefore, even longliners are not

Japan (Contd.):

making good yellowfin catches. For longliners and seiners to improve fishing efficiency, they must establish better communications. ('Minato Shimbun,' Apr. 24.)

* * *

NEW BOAT-CARRYING TUNA MOTHERSHIP IS IN EASTERN PACIFIC

The new portable-boat-carrying tuna mothership 'Zenko Maru No. 18' (965 gross tons), owned by Ozu Fish Products Co., Misaki, Japan, departed Misaki April 28 for the eastern Pacific.

The vessel has overhead hanger-type refrigerated holds. Equipped with labor-saving devices, it requires only 48 men, compared with over 60 in a similar-sized vessel now operating.

May Indicate Trend

The Zenko Maru is designed to operate out of Japan or an overseas base, depending on where catch would bring higher price. Its construction for longline fishing indicates a possible direction industry may take in the future. For that reason, its performance will be closely watched in Japan until it returns in November. ('Suisan Keizai Shimbun,' May 2.)

* * *

SUMMER ALBACORE TUNA FISHING PICKS UP

The pole-and-line summer albacore fishery was showing signs of improvement. Landings at Yaizu have increased. Until Apr. 20, 5-6 vessels were bringing back only 50 metric tons of pole-caught albacore a day; on Apr. 21 and 22, over 200 tons were unloaded. The fishing grounds are within 12 to 13 hours of port.

Pole-and-line vessels are mostly 39-gross-ton craft. Exvessel price for pole-caught albacore was around US$479 a short ton. ('Suisan Keizai,' Apr. 25.)

* * *

SOUTHERN BLUEFIN TUNA CATCH DROPS

Japanese longliners began fishing for southern bluefin tuna off Australia about $2\frac{1}{2}$ years ago. They harvested 30,000-40,000 tons annually until late 1968. Since then, landings have fallen off sharply. In March 1969, catch per vessel was down to around 0.7 ton a day, compared with 3 tons before.

Restrictions Urged

The Far Seas Fisheries Research Laboratory, Japanese Fisheries Agency, attributes the fall-off to fishing egg-bearing adults during spawning season. Spawning occurs off southern and western Australia from Oct. through Feb. The laboratory explained the bluefin grounds can be sufficiently rehabilitated if fishing is diverted to another area. Therefore, the Agency is urging fishermen to carry out voluntary catch restrictions as soon as possible. ('Shin Suisan Shimbun Sokuho,' Mar. 8.)

* * *

FROZEN TUNA EXPORTS TO U.S. ARE SLOW

In early Mar. 1969, direct exports of frozen tuna to the U.S. were slow because of good yellowfin fishing by California fishermen. Some Japanese trading firms were shipping limited quantities of frozen gilled-and-gutted yellowfin to U.S. west coast packers priced around US$420 c.i.f. a short ton. Prices for frozen round albacore exports to the west coast, unchanged for several months, were quoted at $515 a short ton. ('Katsuo-maguro Tsushin,' Mar. 5.)

* * *

BRAND PROMOTION PUSHED IN ADVERTISING CANNED TUNA IN U.S.

The Japan External Trade Organization's (JETRO) Fishery and Agriculture Division senior analyst has returned to Japan after 5 years in New York. He has advised Japanese firms to combine brand promotion in their joint canned tuna advertising in the U.S.

Promotion in U.S. Changes

He noted that the concept of Japanese canned tuna promotion in the U.S. has changed.

Japan (Contd.):

Now it involves few political problems. U.S. demand for canned tuna is strengthening and the market increasing. Quality and price differences between major U.S. brands and Japanese product are narrowing. It is necessary, therefore, to concentrate on brand promotion. ('Kanzume Nippo,' Apr. 26.)

* * *

CANNED-TUNA PROMOTION WILL BE INCREASED

The Japan Export Tuna Packers Assoc. will increase the budget for canned-tuna promotion in the U.S. and Europe. In the U.S., it is now about US$91,667, contributed equally by government and industry.

Because U.S. domestic packs and other imports compete strongly with the Japanese product, the Association feels a need to review promotion and to develop a combined plan for the U.S. and Europe. The Association is thinking of doubling the present budget. It would allocate about 10% of it to study supply conditions in overseas tuna bases as part of the raw material procurement plan for Japanese packers. ('Kanzume Nippo,' Apr. 21.)

* * *

SLUMP IN CANNED MACKEREL EXPORT PRICE TO PHILIPPINES

Prices for Japanese canned mackerel exports to the Philippines have been dropping in recent months. In mid-April, they slumped to US$4.50 a case, c. & f. Manila, for No. 1 small 100's in tomato sauce ($5.50-5.60 per case in 1968), and to c. & f. $5.30 case for 1-lb. tall 48's natural pack (c. & f. $6.15 a case in summer 1968).

The sharp price reduction was attributed to heavy accumulation of unsold stocks by Japanese trading firms. This put Philippine buyers, who had only limited funds available to set up letters of credit, in a good position to force down prices. ('Suisan Tsushin,' Apr. 19.)

* * *

FISH PASTE ('KAMABOKO') SHIPPED TO U.S.

On April 16, Odome Kamaboko (boiled fish paste) Manufacturing Co. in Nagato, shipped 1,000 pieces of vacuum-packed high-quality 'Kamaboko' valued at US$550 to the U.S. It was the first large shipment of 'kamaboko' to the U.S.

The firm plans to actively promote the product on the U.S. west coast and in Hawaii. Many Japanese-Americans live in these areas. It is made from lizardfish and has a shelf life of about a month. ('Minato Shimbun,' Apr. 17.)

* * *

NEW GILL-NET LONGLINER FISHING IN BERING SEA

The new gill-net longliner 'Tenyu Maru No. 37' (499 gross tons) departed Onahama April 15 on her maiden voyage to the eastern Bering Sea. She was scheduled to operate around St. George Island, east of 175° W. longitude, for about 2 months fishing primarily for Alaska pollock, sablefish, and herring.

Fishing Area Changed

Tenyu Maru had attracted considerable attention from fishermen in northern Japan because her owners previously had announced plans to send her to the eastern Pacific to fish saury off the U.S. west coast.

Equipment

The vessel, equipped with modern navigational devices, is designed to operate under all weather conditions. With the bridge located amidships, she can operate longline and drift-gill-net gear simultaneously. Owned by Ogata Gyogyo Fishing Co., she was built at a cost of about US$722,000 and carries a crew of 27. ('Suisan Keizai Shimbun,' Apr. 15.)

* * *

NEW FISH-FINDER DEVELOPED

Japan's Koden Electronics Co. has developed a fish-finder with a totally new kind of electronic recording system. There are 2 models--a bottom-spread system for bottom trawling, and a range-spread system for midwater trawling and tuna longlining.

Japan (Contd.):

New Principle

The present fish-finders operate the recording pen mechanically. Koden's device completely eliminates mechanical movement of the pen. It uses an electronic scanning and recording system to control 320 special recording pens, called "multi-pens," lined up in a row like the teeth in a comb. Free control of electronic sweeper circuits connected to the individual pens permits recording to be done by moving the printing paper at proper speeds. With this instrument, various observations previously considered impossible to record can be registered very simply and accurately.

Patents and Prices

Koden has applied for patents in Japan, the U.S., and leading European countries. The product was scheduled to go on sale in May 1969. Prices range from US$1,944 to 5,000. ('Suisan Tsushin,' Apr. 16.)

* * *

SURVEY TEAM RETURNS FROM SURINAM

The 5-man, Japanese government-industry fishery team sent to Surinam for 3-week survey of shrimp and other coastal fishery resources returned to Japan on April 26. The survey was conducted in response to a request by the Surinam Fisheries Director for assistance in developing fishery resources, primarily shrimp, and in constructing shore facilities.

Abundant Resources

The Japanese team found an abundance of shrimp, croaker, skipjack tuna, and other varieties off Surinam. Its members stated that the trip was very meaningful. They will consult with the Fisheries Agency to decide what form of assistance Japan can give. ('Minato Shimbun,' Apr. 29.)

* * *

CONSTRUCTION OF 859 FISHING VESSELS AUTHORIZED IN FY 1968

During fiscal year (FY) 1968 (April 1968-March 1969), the Japanese Government authorized construction of 859 fishing vessels (102,094 gross tons): 569 steel vessels (91,714 tons) and 290 wood (10,380 tons).

Kind of Vessel	No. of Vessels		Gross Tons	
	Steel	Wooden	Steel	Wooden
Distant-water trawlers.	19	-	7,257	-
Isei (East China Sea) trawlers .	92	-	12,146	-
Offshore trawlers	71	35	4,622	1,199
Tuna vessels	175	76	41,949	4,378
Purse seiners	59	22	5,724	599
Purse-seine auxiliary vessels .	29	8	2,310	165
Salmon drift gill-netters . . .	100	32	8,442	1,407
Miscellaneous long-liners . . .	5	47	1,436	1,307
Carriers	2	9	5,000	241
Government vessels	14	4	2,781	140
Others	3	57	47	944
Total	569	290	91,714	10,380

Of steel vessels, 175 (about 30%) were tuna vessels (41,949 gross tons).

Sixty-nine of the steel tuna vessels were 200-300 tons; 41 between 300 & 400 tons; 39 under 100 tons; and 26 between 100-200 tons.

The 290 wooden hulls included 76 tuna vessels (4,378 gross tons). ('Suisan Keizai Shimbun,' May 2.)

South Korea

FISHERY EXPORTS TO INCREASE IN 1969

South Korea has set the 1969 export target for fishery products at US$68 million. This is 9.7% of total export target of $700 million. It is an increase of 33% over 1968's fishery exports of nearly $51 million.

Planned Exports

Among the planned increases for 1969 are: live fish $10 million (up $3 million from 1968), frozen fish $7 million (up $2.4 million), and tuna $21 million (up $4.5 million). Laver at $15 million will be a drop of $2 million. Fishery products are second to manufactured products in the total 1969 commodity export plan. (U.S. Embassy, Seoul, Apr. 4.)

* * *

PLANS TO DEVELOP AQUACULTURE

South Korea has an ambitious aquaculture development plan extending into 1971. It calls for investment of 4,145 million won (about US$15.2 million). It includes cultivation of

South Korea (Contd.):

finfish, shellfish, turtle, and seaweed in inland waters for both domestic and foreign consumption. ('FAO Fish Culture Bulletin,' vol. 1 (2), Jan.)

* * *

ATLANTIC TUNA COMPANY ESTABLISHED

A new fishery company has been set up in Seoul, S. Korea, by the International Basic Economy Corporation (IBEC). It is a joint venture of Transoceanic Fishing Corporation (TFC), a division of IBEC, and TFC's former Seoul manager who is president of the new company. The contract allocates 75% of the shares to TFC. The president gets 25% and an option to buy up to 50% of total shares over the next 10 years.

To Catch Atlantic Tuna

Company assets include two 300-gross-ton tuna vessels. The vessels will catch tuna in the Atlantic and deliver catches to Cape Verde Islands for transshipment to IBEC cannery in Puerto Rico. TFC has operated 3 Korean-crewed tuna vessels under the Panamanian flag for the past 2 years. This operation will be continued jointly with the new company. (U.S. Embassy, Seoul, Feb. 17.)

South Vietnam

POSTWAR FISHERIES EXPANSION PLANNED

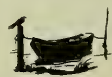
Rehabilitation and modernization of the fishing industry will play a prominent role in South Vietnam's 10-year postwar reconstruction programs, according to South Vietnam's Minister of State for Postwar Planning. The statement was made in a press interview in Bangkok, Thailand. Stressing the need for expanding high-seas fisheries, the Minister said that more technicians and modern equipment would be required.

FAO Assistance

With FAO assistance, South Vietnam recently began a high-seas fisheries development and training program. Its fisheries technicians are trained aboard trawlers contributed by Japan and the Netherlands. The first training cruise started in early 1969; other cruises are expected later in the year.

U.S. Aid

The U.S. is contributing aid to reconstruct the Saigon fish market, build cold storage facilities in and around Saigon, rebuild La-Gi fishing harbor, and develop fresh-water fisheries.



North Vietnam

TO REORGANIZE AND EXPAND FISHERIES

North Vietnam will push fishery expansion in 1969, according to an editorial in the Communist Party organ 'Nhan Dan.' There are 2 reasons for the plan: food shortages and a need for foreign currency. Another stimulus is the striking contrast in the last 5 years between progress in fishery development in South and North Vietnam.

Compared with South Vietnam

According to FAO data, North Vietnam's catches increased at about the same rate as South Vietnam's until 1962. Then North Vietnam landed 288,000 metric tons--30% more fish than in 1961--and surpassed South Vietnam's 222,000. After 1962, statistics are available only for South Vietnam, whose 1967 catch reached 410,000 tons. Estimated North Vietnamese catch in 1967 was only about 200,000 tons; it has been going down steadily since 1963. To stop this decline, the Central Committee of the Communist Party has directed a new approach to fishery development. North Vietnam will attempt to increase her catch to about 250,000 tons "in the immediate year."

1969 A Turning Point

North Vietnam's fisheries never have been really developed; 1969 will be the "turning point." Administratively, as in the USSR, both state-owned and cooperative-owned fisheries will be set up. The cooperatives, disorganized now, will be "guided" by the state-owned fisheries. Poor economic management and outdated equipment are the principal "weak

North Vietnam (Contd.):

links." Gear and vessels will have to be mechanized. Shore bases employing local people will be established.

The editorial states that the potential annual yield available to North Vietnam's fishing industry is about 1 million metric tons. ('Nhan Dan,' Mar. 15.)

Taiwan

ASIAN BANK LOANS US$10 MILLION TO BUILD TUNA LONGLINERS

The Asian Development Bank has approved a US$10 million loan to the Republic of China (Taiwan) to build and outfit forty 250-ton tuna longliners. The cost, including interest and working capital, has been estimated at US$16.7 million.

The loan, with an interest rate of 6.9% per year, will be amortized over 13 years, including a 3-year grace period. The proceeds of the loan will be reloaned to approved fishing companies through the Cooperative Bank of Taiwan.

What Project Will Do

The project will contribute significantly to Taiwan's 5-year program to accelerate fishery development. It will enable Taiwan to increase foreign trade and overseas earnings--and to provide jobs for students graduating from maritime colleges and fishing schools. It also will provide better use of shipbuilding and related shore facilities.

Fisheries Bureau's Role

Taiwan's Fisheries Bureau will prepare the technical design of the vessels. The Bureau also will provide technical advice to operating companies, supervise operations, and ensure proper vessel maintenance. Taiwan has the shipbuilding facilities and managerial and technical capabilities to produce 250-ton tuna longliners.

The Vessels

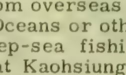
The vessels will be about 43 meters long (141 ft.) overall, 7.5 meters broad (24.6 ft.), and 3.35 meters deep (11 ft.). They will have 700 horsepower main diesel engines and 10.5-knot service speed. The vessels will carry 25 officers and crew, and be able to operate efficiently in all deep-sea areas. Technical equipment will include a complete radio communication system, modern navigation apparatus with radar, fish-finder, and deck machinery. A 50-cubic-meter quick-freezing room will be large enough to handle daily catches; it will freeze fish to -35° C. (-31° F.). Cold-storage rooms will hold about 300 cubic meters of fish at -20° C. (-4° F.).

The vessels will be capable of year-round operation from overseas bases in the Indian or Atlantic Oceans or other fishing grounds. The new deep-sea fishing harbor nearing completion at Kaohsiung will be home base. It will be necessary to return to Taiwan for major overhaul about once every 2 years.

For Export

Ninety-five percent of their annual catch will be exported. Foreign exchange earnings of the 40 vessels may reach about US$5.5 million a year. (U.S. Embassy, Manila, Apr. 1.)

Also, the loan will finance construction of twelve 160-ton high-seas tuna fishing vessels, two 1,500-ton fish carriers, one large purse seiner, several high-seas fishing vessels totaling 8,500 tons, and coastal fishing vessels totaling 3,500 tons. These vessels are scheduled to be built in 1970. ('Suisan Keizai,' Mar. 5.)



Thailand

EXPANSION OF DEEP-SEA FISHERIES PLANNED

The Thai Fisheries Department is urging expansion of deep-sea fisheries. It will loan fishermen 50 million baht (US$2.4 million) to build large trawlers. The money will be advanced by the Asian Development Bank.

Thai Fishing Fleet

At present, Thailand has about one hundred 80-100-ton trawlers suitable for deep-sea fishing. It has about 39,000 fishing vessels in all, including 6,000 trawlers. In 1968, Thailand processed about 139,101 tons of fish for fish sauce.

Thailand (Contd.):

Research and Training

Thailand will cooperate with Denmark to establish a Marine Fishery Research Center at Phuket Island. It should be operational by late June 1970.

In late March 1969, the Southeast Asian Fisheries Development Center approved US$60,000 for a Marine Fisheries Training Department in Bangkok. (U.S. Embassy, Bangkok, Apr. 11.)

Mauritius

SOVIET RESEARCH VESSEL VISITS PORT LOUIS

A 3-ship Soviet naval flotilla had just sailed out of Port Louis harbor and off the front pages of the Mauritian press when another Soviet vessel sailed in with a gift of frozen fish. The fishery research vessel 'Aelita' was returning from 4 months (Nov. 11 to Mar. 15) in the Antarctic. She unloaded 11,000 pounds of fish (mostly Notothenia and Macrophthalma) for hospital patients. A penguin was given to Pokunlall Ramlall, director of the People's College, and president of the Mauritius-USSR Friendship Society.

Chief Scientist Interviewed

The daily 'L'Express' interviewed the chief scientist, Valerii Tod. He said the vessel had been on a mission for a Soviet Fisheries and Oceanography Institute. He warned that commercial fishing around Mauritius by Japanese and Taiwanese boats would eventually kill off big game fishing. He recommended that Mauritius establish territorial limits of 20 miles, at least to protect itself against the Japanese.

Offers Soviet Aid

The scientist stated: "The USSR assists numerous countries in the fishing field at the request of their governments. I don't see why Mauritius doesn't make a similar request. The Soviet Government would never refuse to help such friendly and hospitable people like the Mauritians. The USSR could send research vessels, technicians, and fishing vessels. Mauritians could be given intensive training in new fishing methods. Everything depends on the needs of Mauritius. We are even prepared to take Mauritians fishing in the Antarctic. The USSR has advanced techniques and is thinking of canning tuna in Mauritius for local consumption and for export. One day, perhaps, Mauritians could buy at special low prices Soviet-made ultramodern fishing boats."

HOW THICK IS THE ICE IN THE ARCTIC OCEAN?

The average thickness of the Arctic ice pack is about 9 to 10 feet, although in some areas it is as thick as 65 feet, with pressure ridges extending downward into the ocean as much as 125 feet.

The atomic submarine NAUTILUS passing beneath the North Pole on August 3, 1968, measured a pressure ridge extending 25 feet down. The depth of the ocean at the North Pole was recorded as 13,410 feet; depths as great as 13,776 feet have been recorded near the Pole.

Ice floes ranging from 7 to 13 feet in thickness have been reported in the Arctic. Icebergs, which are pieces of glacial ice floating in the sea, are many times thicker than sea floes. ("Questions About the Oceans," U.S. Naval Oceanographic Office.)

SOUTH PACIFIC

Australia

NORTHERN TERRITORY HAS POOR SHRIMP SEASON

The Northern Territory's first large-scale shrimp season has been a major disappointment. Catches failed to meet more than a third of the cost of operating the 20 trawlers in the fishery. Catches represent only a fraction of expected levels.

The season began early in March. Despite poor returns, companies with millions of dollars invested in trawlers, processing plants, and associated facilities were optimistic that catches would improve later.

Previous Increases

For the six months ending Dec. 1968, shrimp exports increased 52% in weight and 75% in value over 1967 period.

Australian Frozen-Shrimp Exports

	Six Months Ended December			
	1967	1968	1967	1968
	Quantity		Value	
	. (1,000 Lbs.) .		. (A$1,000) .	
Destination:				
Japan	1,703	1,222	1,710	1,361
South Africa	184	218	240	313
United States	170	1,486	165	1,755
United Kingdom . .	164	448	142	525
Other	209	309	186	317
Total	2,430	3,683	2,443	4,271

Note: A$0.89 = $US1.00.

American Samoa

MAY 1969 TUNA PRICES SET

Japanese suppliers and U.S. packers in American Samoa agreed on prices for May 1969 tuna deliveries. Prices per short ton were the same as April's--albacore: frozen US$420, iced $405; gilled-and-gutted yellowfin: frozen $337.50, iced $317.50. The Japanese originally had asked a $15-a-ton price increase for both species. ('Suisan Tsushin,' May 18.)

* * *

NEW MINIMUM WAGES SET FOR FISHERY WORKERS

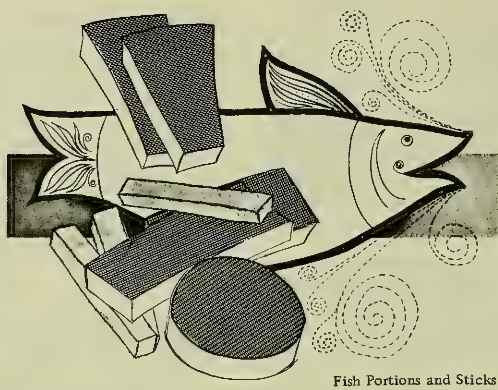
New minimum wage rates for fishery workers (among others) in American Samoa have been announced by the U.S. Department of Labor. The rates apply to about 2,500 workers in private industry, schools, and hospitals; most of the rates are slated for another increase in one year.

The rates were recommended by an Industry Committee of employers, employes, and public. The committee was authorized to recommend minimum wage rates required by the Fair Labor Standards Act.

The New Rates

Minimum wage rates for the Fish Canning and Processing and Can Manufacturing Industry are: $1.15 beginning June 5, 1969, and $1.20 beginning June 5, 1970.

FOOD FISH FACTS



Fish Portions and Sticks.

Within the last decade an entirely new line of frozen food products has entered the consumer market. The success of these products has been tremendous. Today's homemaker has a selection of food in easy-to-prepare forms that were unknown 10 years ago. Along with many others, frozen convenience seafoods have become popular throughout the nation, with fish portions and sticks leading the field.

As an example of how fish portions and sticks have caught on in the United States, statistics compiled by the Bureau of Commercial Fisheries show that from a beginning in the mid '50s, the combined production of fish portions and sticks in 1968 rose to over 270 million pounds. This figure continues to grow as additional drive-ins, restaurants, schools, institutions, and homemakers are introduced to these convenience seafoods.

DESCRIPTION

Fish portions and sticks are generally made of cod, haddock, or pollock and come in frozen, raw or partially-cooked forms. Fish portions can be obtained either breaded or unbreaded. They come in a variety of sizes and shapes to meet the requirements of different markets. Portions and sticks are cut by machine from large, solidly-frozen blocks of fish fillets. The cut pieces are dipped into a batter and coated with breading. Most fish sticks and some portions are then partially cooked. Partially-cooked fish portions and sticks take only minutes to prepare. Uncooked portions and sticks take slightly longer. For best results, follow the directions on the package for cooking time and temperature.

Fish portions range in size from $1\frac{1}{2}$ to more than 5 ounces and come in square, round, and rectangular shapes. Generally speaking, one 8 or 10 ounce package of fish portions will serve two. Raw breaded fish portions are at least $\frac{3}{8}$ inch thick and contain not less than 75 percent fish. Partially-cooked fish portion are at least $\frac{3}{8}$ inch thick and contain not less than 65 percent fish.

Fried fish sticks are 3 to 4 inches long and weigh up to $1\frac{1}{2}$ ounces. They are at least $\frac{3}{8}$ inch thick and contain not less than 60 percent fish. An 8-ounce package will make two servings.

(Continued following page.)

PURCHASING TIPS FOR FROZEN FISHERY PRODUCTS

Check carefully to see that the container is intact.

Avoid packages which have been stacked above the "load line" or "frost line" of the freezer.

Take only those packages which are solidly frozen.

Check for "drip" or ice on the outside of the package. This may indicate that the contents have thawed and been refrozen.

In buying cello-wrap packages, check for discoloration or other signs of freezer burn.

Frozen fish should have little or no odor; a strong fish odor means poor quality.

Within a few short years frozen fish portions and sticks have become an American standard, being featured as "fishburgers" or fish sandwiches in drive-ins and restaurants across the land. Volume feeding operations have incorporated portions and sticks into their menus with great success. Today's homemakers are preparing practical portions and sticks in a variety of imaginative ways for family dining.

Fish portions and sticks are a product of our rapidly changing society and it appears that their future is rosy, as producers, wholesalers, retailers, and consumers are shaping their activities around the convenience food product. (Source: National Marketing Services Office, BCF, U. S. Department of the Interior, 100 East Ohio, Rm. 526, Chicago, Illinois 60611.)

(Recipe on p. 74.)

IT'S SUMMER--DO YOUR THING WITH SEAFOOD

It's summer and you're tired of spending hours in the kitchen. Right? Okay, get out and enjoy the summer air and allow yourself to live a little. How? Here's how--explore the wonderful world of quickly-prepared, convenience seafoods. A wide selection of ready-in-minutes fishery products can be found in the frozen seafood section of your market, ready and waiting to please and nourish your family.

Of all the seafood convenience products on the market today, fish sticks and portions have grown the fastest, according to the Bureau of Commercial Fisheries. Nearly 92 million pounds of fish sticks and more than 179 million pounds of fish portions were produced during 1968. This was a record year for both products. The increased consumer acceptance of these products is probably because the fishing industry and the Bureau are constantly striving to advance product development as well as improving freezing, packaging, and storing methods.

Fish portions and sticks are generally cut from frozen blocks of cod, haddock, or pollock fillets. They may be bought raw or partially cooked, usually breaded, and frozen. These products should not be thawed before cooking which saves time for the busy homemaker. Shapes of portions and sticks vary from square or round to the more popular rectangular shape and range in weight from 1 to 5 ounces.

Fish Barbecue, a Bureau of Commercial Fisheries tested recipe, is a satisfying treat with an interesting new approach in preparation. Instead of first being fried, then served with a sauce on a bun, this unusual recipe allows the portions to absorb the tangy flavor of the easily-made barbecue sauce by being simmered in the sauce. Try it out on those hungry people around your house. Fish Barbecue will be a favorite and--you can take time out to live a little!

Fish Barbecue

6 frozen raw breaded fish portions ($2\frac{1}{2}$ to 3 ounces each)
6 poppy seed twist rolls, toasted
Barbecue Sauce

Place frozen portions in a single layer in hot Barbecue Sauce in a 12-inch fry pan. Cook over low heat for 8 to 10 minutes. Turn carefully. Cook 8 to 10 minutes longer or until fish flake easily when tested with a fork. Serve on rolls. Makes 6 servings.

Barbecue Sauce

$\frac{1}{4}$ cup chopped onion
2 tablespoons butter or margarine, melted
$1\frac{1}{2}$ cups catsup
$\frac{1}{4}$ cup brown sugar
$\frac{1}{4}$ cup vinegar
2 tablespoons lemon juice
2 tablespoons Worcestershire sauce
$\frac{1}{4}$ teaspoon salt

Cook onion in butter until tender in a 12-inch fry pan. Add remaining ingredients. Heat. Makes approximately 2 cups sauce.

The Bureau of Commercial Fisheries, United States Department of the Interior, has a full-color recipe booklet that shows you how to save time. Time for Seafood (I 49.49/2:12) Fishery Market Development Series No. 12, costs 45¢ and is filled with quick-fix fish and shellfish recipes that are certain to get the busy homemaker out of the kitchen in record time.

Another Bureau booklet, Fish for Compliments on a Budget (I 49.49/2:9) Fishery Market Development Series No. 9, costs 15¢ and contains time and budget-saving recipes. Both are available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402. (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 E. Ohio, Rm. 526, Chicago, Ill. 60611.)

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HOW DEEP IN THE OCEAN CAN ONE SEE WITH NATURAL SUNLIGHT?

Even when perfectly clear, water is at least a thousand times more opaque than air, because of the density difference. The depth to which one can see in the ocean is dependent on the amount of suspended matter and the angle of sunlight. Underwater visibility is best at noon when the sun is directly overhead; at that time about 98 percent of the light penetrates the sea surface. When the sun is at an angle of 10 degrees above the horizon, only 65 percent of the light penetrates; the rest is reflected.

Tropical waters usually have high transparency; the Mediterranean Sea, particularly the eastern section, is also noted for its good transparency characteristics.

As a diver descends into the ocean, the first change he notices is that everything appears to be blue-green; when he approaches the 100-foot level, it becomes impossible to distinguish colors. Light appears to come from all directions and there are no shadows. Cousteau reports that at 300 meters the pale blue lighting is hardly sufficient to define the shapes of objects a short distance away.

Sometimes horizontal visibility is better at greater depths because of the higher amounts of suspended materials in surface waters. Italian divers working on the liner 'Egypt' southwest of Brest, France, reported that visibility diminished as they went to a depth of 66 feet, then improved. Light faded as they reached the wreck at 396 feet; at that depth, visibility was 6 feet. ("Questions About the Oceans," U.S. Naval Oceanographic Office.)

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES